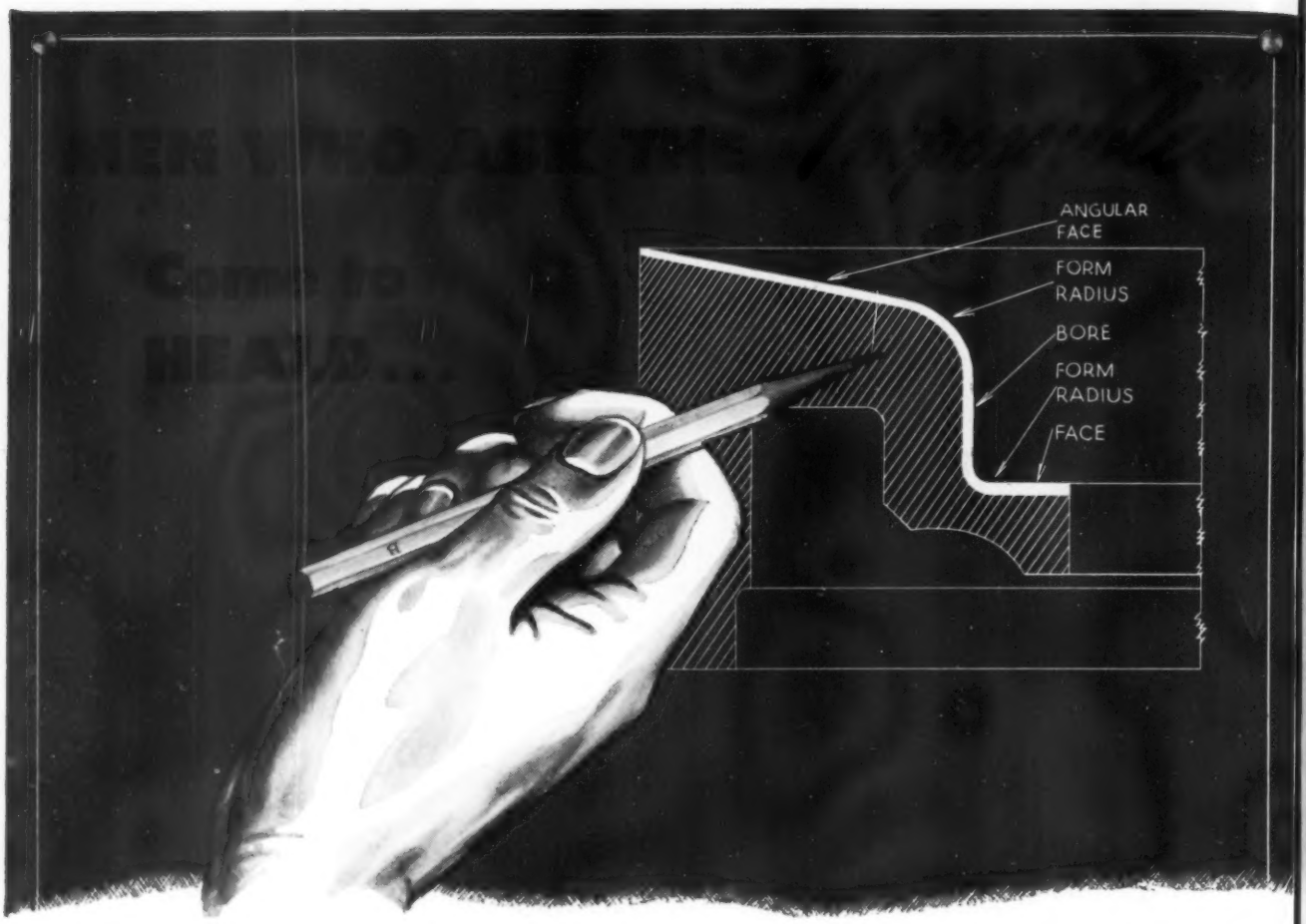
DECEMBER 7, 1944

American Machinist

TECHNOLOGY DEPT.
DEC
DETROIT

How the B-29 Is Built

AN ACCOUNT OF THE SHOP WORK BEHIND THE SUPERFORTRESS



AND GET IT WITH *Precisioneering!*

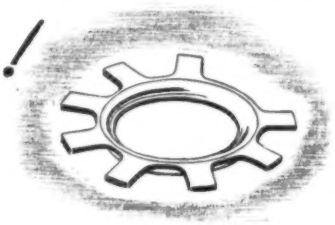
Yesterday's "impossibilities" are today's production achievements. And *today's "impossibilities"* will be the means of putting your post-war product one jump ahead of competition.

Finding ways to step up production rates . . . or finish more surfaces per machine . . . or hold closer tolerances . . . or minimize rejects. In short, to make a better product at lowest possible cost.

That is the essence of what Heald *Precisioneering* offers you. And it inevitably results when we add custom-built tooling and fixtures to a carefully selected basic machine design.

Why not sit down with some of the 250 *Precisioneers* at Heald Headquarters in Worcester . . . or call in one of our local field engineers. They will offer for your consideration *proved* ideas and production methods for improving your boring, turning, facing and grinding operations.

THE HEALD MACHINE CO.
WORCESTER 6, MASS.



Another Example of

PRECISIONEERING RESULTS

Formerly two machines were needed to finish this knuckle pin locking plate. It was a tricky operation as the section view at top shows. Production lagged. ***Now*** a single Bore-Matic bores a 4.0455" hole, forms a .06" radius and generates the bottom face; generates the 14° angular face and plunge cuts a .13" radius to blend with it and the bore—*all automatically!*

HEALD *for precision plus . . . economy plus*

Internal and Surface Grinding Machines • Bore-Matic Precision Finishing Machines

American Machinist

December 7, 1944

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From _____

_____

To _____

_____

Signed _____

American Machinist Chips

Superfort Scoop . . . It is a privilege to bring you in this issue what is, to our knowledge, the first production story of the famous B-29 Superfortress.

This feature, in pictorial style, reveals some very interesting data of the plane's fabrication in Boeing's Wichita plant.

Additional articles on the production of these flying battleships are in the making, so keep your eyes peeled.

Incidentally, we call your attention to the fact that we resume with this issue the very authoritative series of articles on milling cutters by M. Martellotti, Research Engineer, Cincinnati Milling. This is No. 3.

Schultz to Schwartz . . . A very interesting letter from Robert A. Schultz of Noblet & Forest, South Australia, expresses appreciation for the data contained in an *American Machinist* article by Arthur A. Schwartz of Bell Aircraft (May 25, 1944) on reducing the number of teeth in milling cutters and thus decreasing cutting time. Mr. Schultz sent us some facts corroborating the information in this article and gave us some of his own experiences in this same type of work.

He concludes, "I would like to compliment Mr. Arthur Schwartz for his very enlightening explanation of the absence of heat generated in this type of cutter and for having the courage to bring forward an idea which, in my experience, has met with more scowls than open arms."

Plastic Protection . . . One of the very interesting recent developments in the Metal-Working field has been the practice of dipping gun barrels and other precision metal parts in a plastic material to prevent rusting while in storage or in transit to the battle front. When the part is ready for use, the plastic "skin" is merely peeled off.

Aluminum . . . August shipments of aluminum products were the second highest in history—being exceeded only by the peak month of March, 1944—according to figures released by WPB. All product groups showed gains with the exception of aluminum sheet and rivets.

1945 Inventory . . . By the time you read this, we will have sent to a large list of Metal-Working plants a request for cooperation in compiling *American Machinist's* 1945 Inventory of Metal-Working Equipment.

Many of you are familiar with this widely-used study . . . which has been made every fifth year since 1925. It reveals not only the amount of machine tools and other equipment installed throughout the country, but also shows how much of it is over 10 years old.

If you have received a questionnaire form to fill out, we ask you to please give it your serious attention. The data it requests will prove of value to your own firm, and the cooperation of all the manufacturers we are surveying will enable us to present a valuable picture of Metal-Working equipment as and where it is today.

This project has the enthusiastic approval of WPB and the military services. All information will be held strictly confidential, and no figures on individual plants will be released.

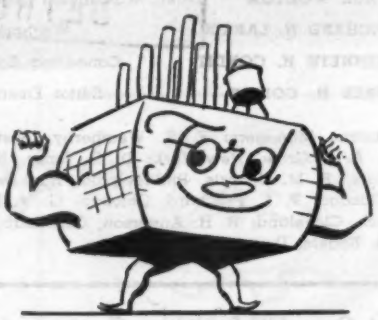
Thanks for your help.

From the Mail Bag . . . From Australia comes the latest testimonial to the value readers place upon the advertising pages of *American Machinist*:

"The advertisements in American Machinist *are of considerable interest to us here, not only to myself, but to other members of the staff, amongst whom your journal is circulated, and who share my opinion that the advertisements form a very useful part of the publication. I would say that they are read as carefully as the technical articles published.*

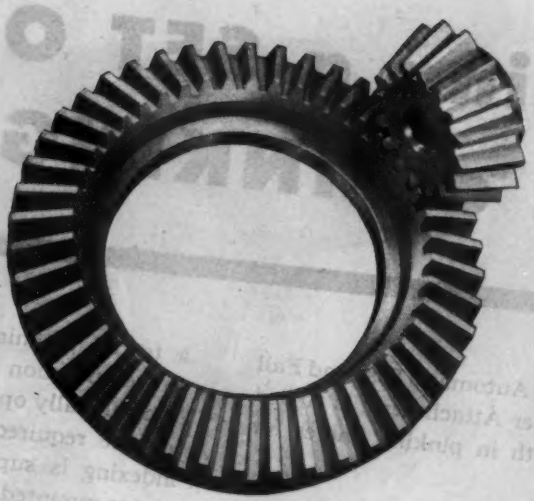
"In this conection, I would say that we here are somewhat disappointed that apparently due to Security Regulations, it is necessary to remove certain pages from the journals forwarded to this country. However, we know that this is only a wartime measure, and look forward to receiving the publication in full at an early date." . . . W. K. Leigh, Manager, Harland Engineering (Australia) Pty. Ltd.

Ford Expansion . . . More than one manufacturer bent an interested ear to the recent announcement that Ford Motor Company plans to spend $150,000,000 for expansion of plants and purchase of new tools and equipment.



This ambitious postwar program will be needed, according to company officials, to accommodate (Ford-wise) an expected total of 40,000,000 car owners after the war. The company also stated that the first postwar Fords will not be merely face-lifted prewar models, but will incorporate more changes than some of the industry's annual revisions in prewar days.

Steel For Wood . . . Milton Male, Research Engineer for U. S. Steel, announced last month the development of a new light-gauge steel said to be more economical than wood. He said the new light steel, developed as a result of war needs, would compete with lumber in the building of postwar homes, factories and apartment buildings . . . with factory pre-fabrication in view, it would eliminate much manual work in home construction.



The GLEASON WORKS is pleased to announce that it is now in a position to furnish Ground Straight Bevel Master Gears.

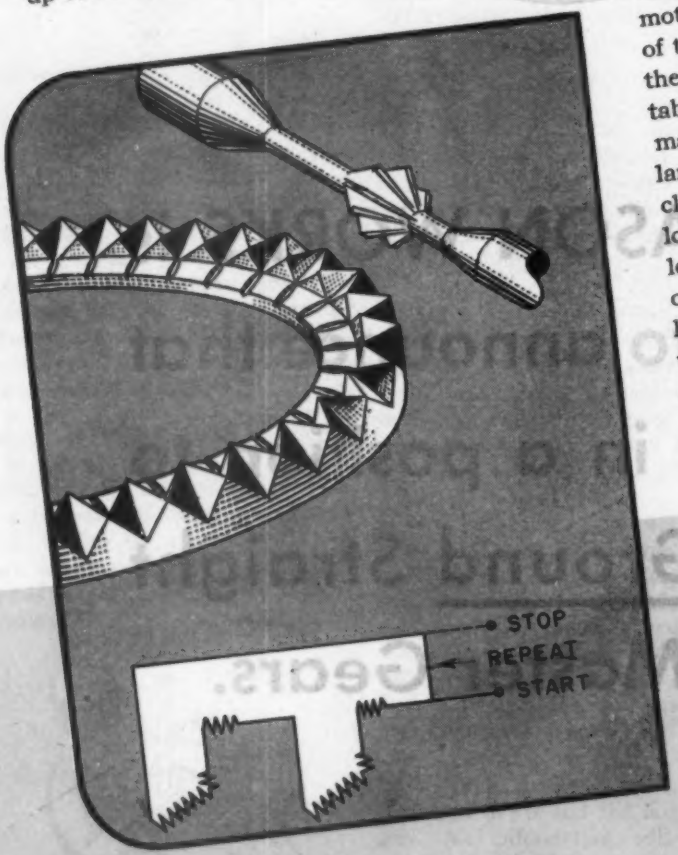
GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

Milling a SET OF TEETH in a PINKING KNIFE

Here a CINCINNATI 0-8 Automatic Rise and Fall Miller, with Cam Roller Attachment, is tooled up for milling the teeth in pinking knives for a textile machine. From start to finish the entire operation is automatic. ¶ The fixture is hydraulically operated, and arranged for indexing the required number of teeth. Power for indexing is supplied from a small hydraulic motor mounted at the extreme right rear corner of the fixture. The fixture is synchronized with the automatic operating cycle which controls table and vertical spindle movements of the machine. The part is secured by means of a large formed washer and "C" washer, allowing clearance for the cutter. ¶ After the fixture is loaded, the operator simply flips the starting lever and the machine performs the operation of milling all the teeth automatically. ¶ Perhaps there is a milling operation in your shop where a setup such as this could be used to advantage. Why not talk it over with our Application Engineers?

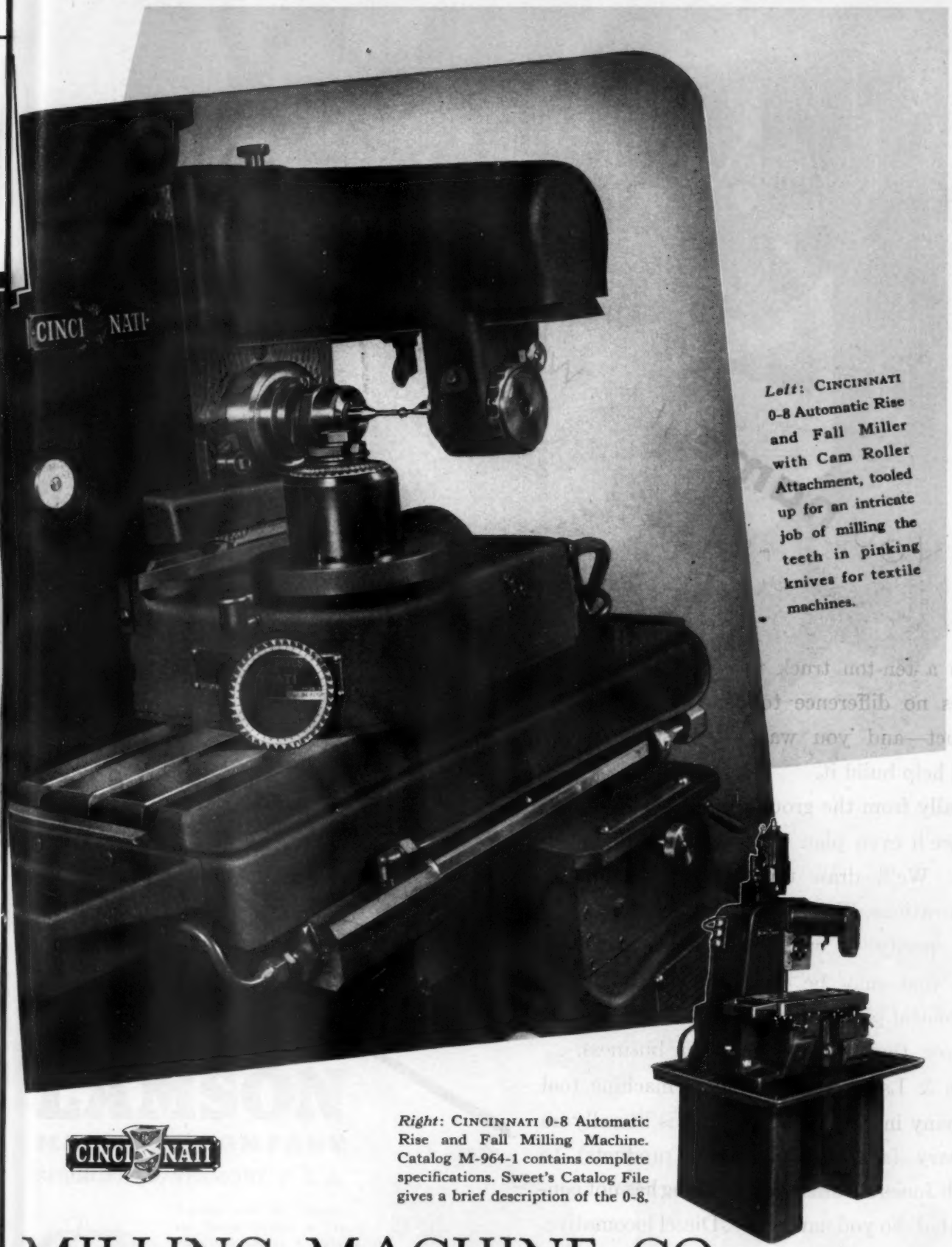


Left: A section of the circular pinking knife, and the cutter used in milling the teeth. The automatic feed cycle for milling one tooth is also shown here. When once started, the cycle repeats until all the teeth in the knife are milled.

Keep on buying
WAR BONDS

THE CINCINNATI

MILLING MACHINES



Left: CINCINNATI 0-8 Automatic Rise and Fall Miller with Cam Roller Attachment, tooled up for an intricate job of milling the teeth in pinking knives for textile machines.

Right: CINCINNATI 0-8 Automatic Rise and Fall Milling Machine. Catalog M-964-1 contains complete specifications. Sweet's Catalog File gives a brief description of the 0-8.

CINCINNATI

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

You **name** it . . . we'll **help build** it!

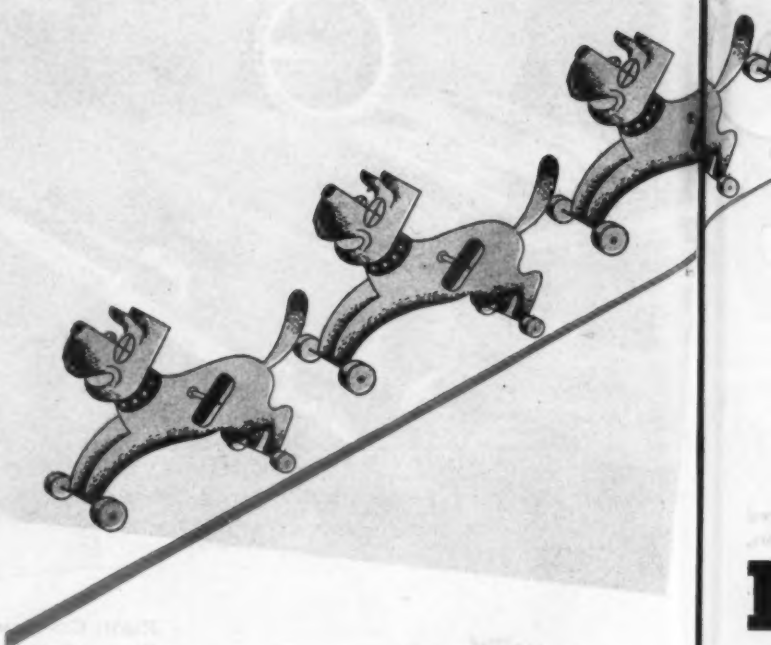
From a ten-ton truck to a ten-cent toy. It makes no difference to us. If it's a sound product—and you want it—just name it. We'll help build it.

Literally from the ground up, if need be.

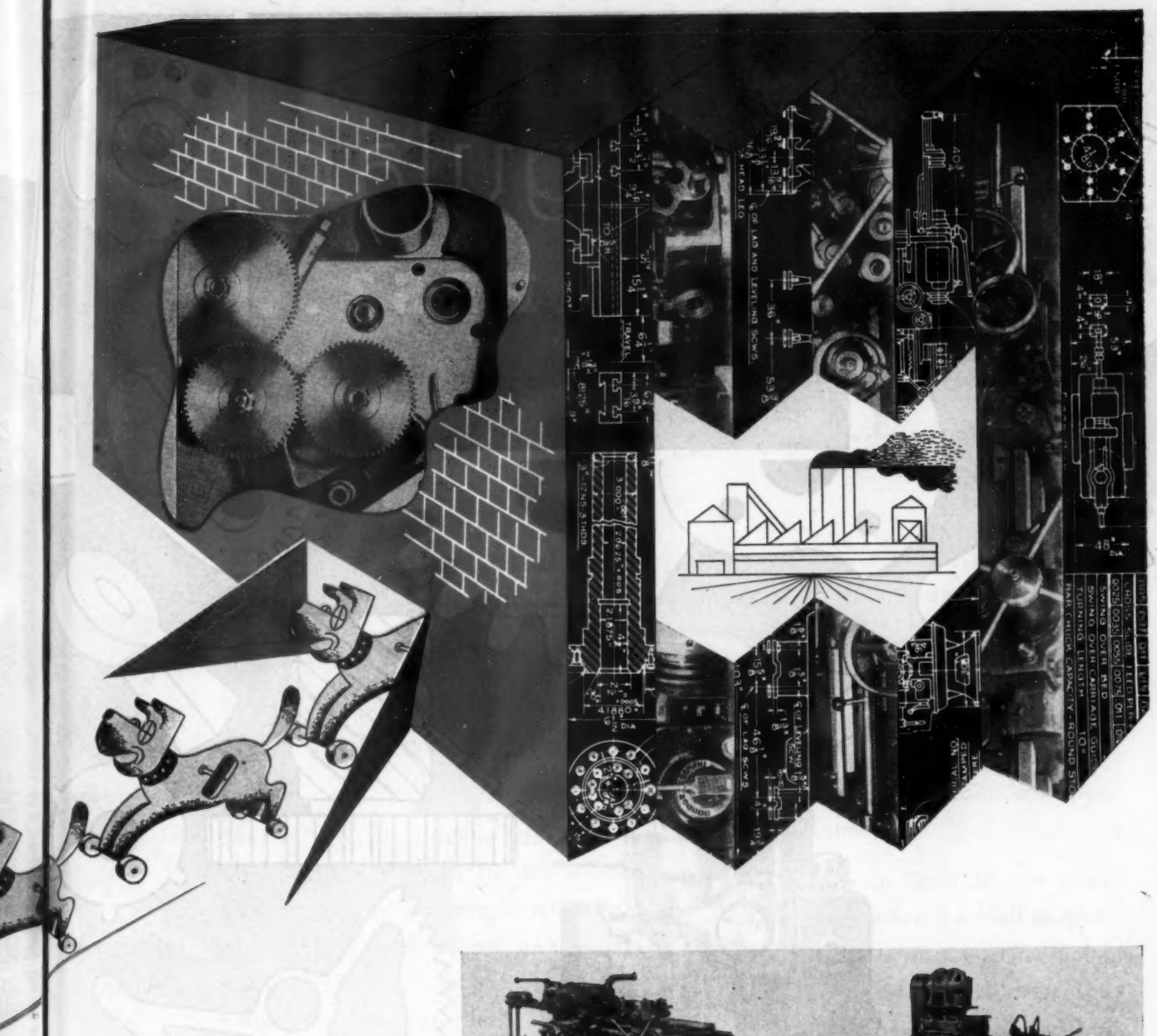
For we'll even plan the plant and its equipment. We'll draw up complete production specifications. We'll engineer the tooling. And we'll specify or create any special machine tools that may be needed for faster, more economical production.

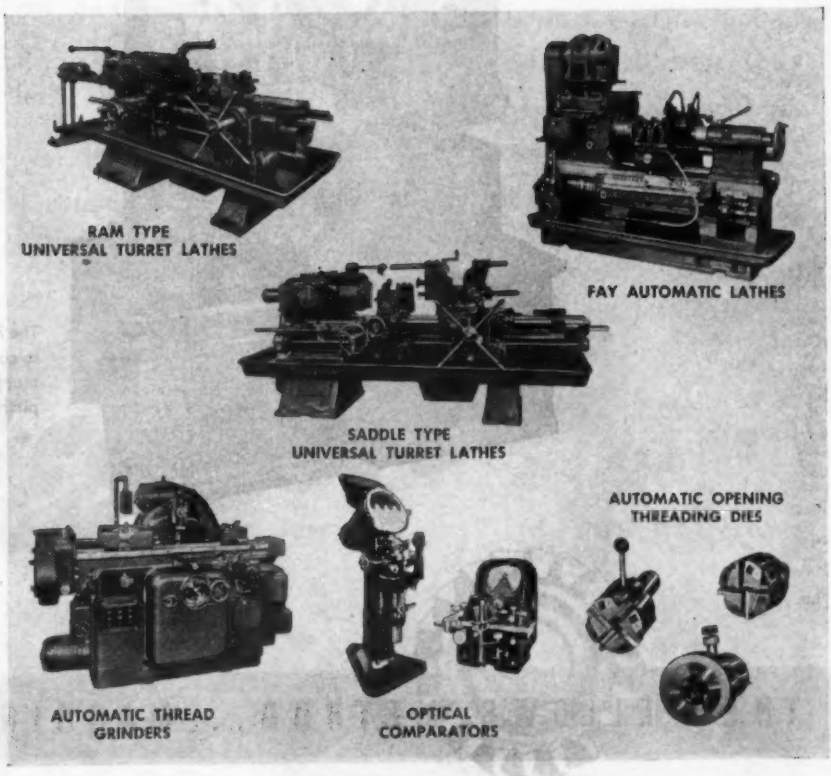
You see, that sort of thing is our business.

Jones & Lamson is the oldest machine tool company in America, and there is literally no industry (and few important products) to which Jones & Lamson engineering has not contributed. So you name it . . . Diesel locomotive, or Dootsybooboo dog . . . we'll help build it!



These engineering facilities will become available to you as soon as conditions permit. Meanwhile, we solicit your inquiries.





JONES & LAMSON
MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Irregular SHAPES?..

The 7-A Type High-Speed Gear Shaper can be equipped to cut both spur and helical gears, and, with special cutters, many irregular shapes. Maximum capacities are: 7 inches pitch diameter, 2 inches face width, 5/7 diametral pitch.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

. . . They're part of the Gear Shaper's Regular job . . .

When a conventional gear cutting job is finished, this machine keeps right on working... because it does other jobs equally well.

★ ★ ★

Chances are, you installed your Fellows Gear Shaper primarily for the economies it gives you in cutting external and internal spur and helical gears, and that you've found those economies even greater than you expected.

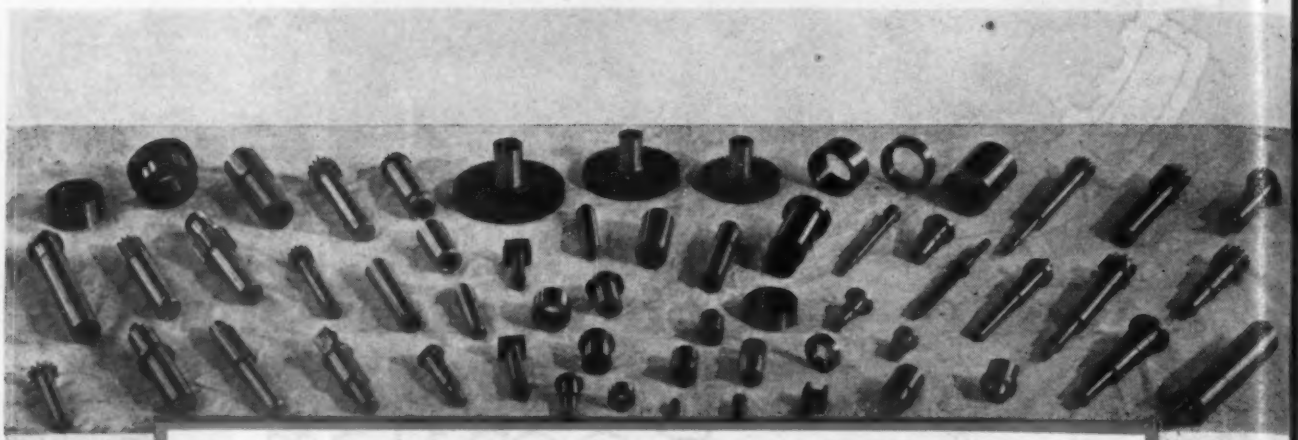
The Gear Shaper, however, is a versatile machine. By simply changing the cutter, your Gear Shaper is ready to cut cams...splines...ratchets...and a large variety of irregular shapes or interrupted profiles.

Cutters of any given design can be provided. And since the accuracy of the generated form is controlled by the cutter, precision is not dependent upon involved adjustments.

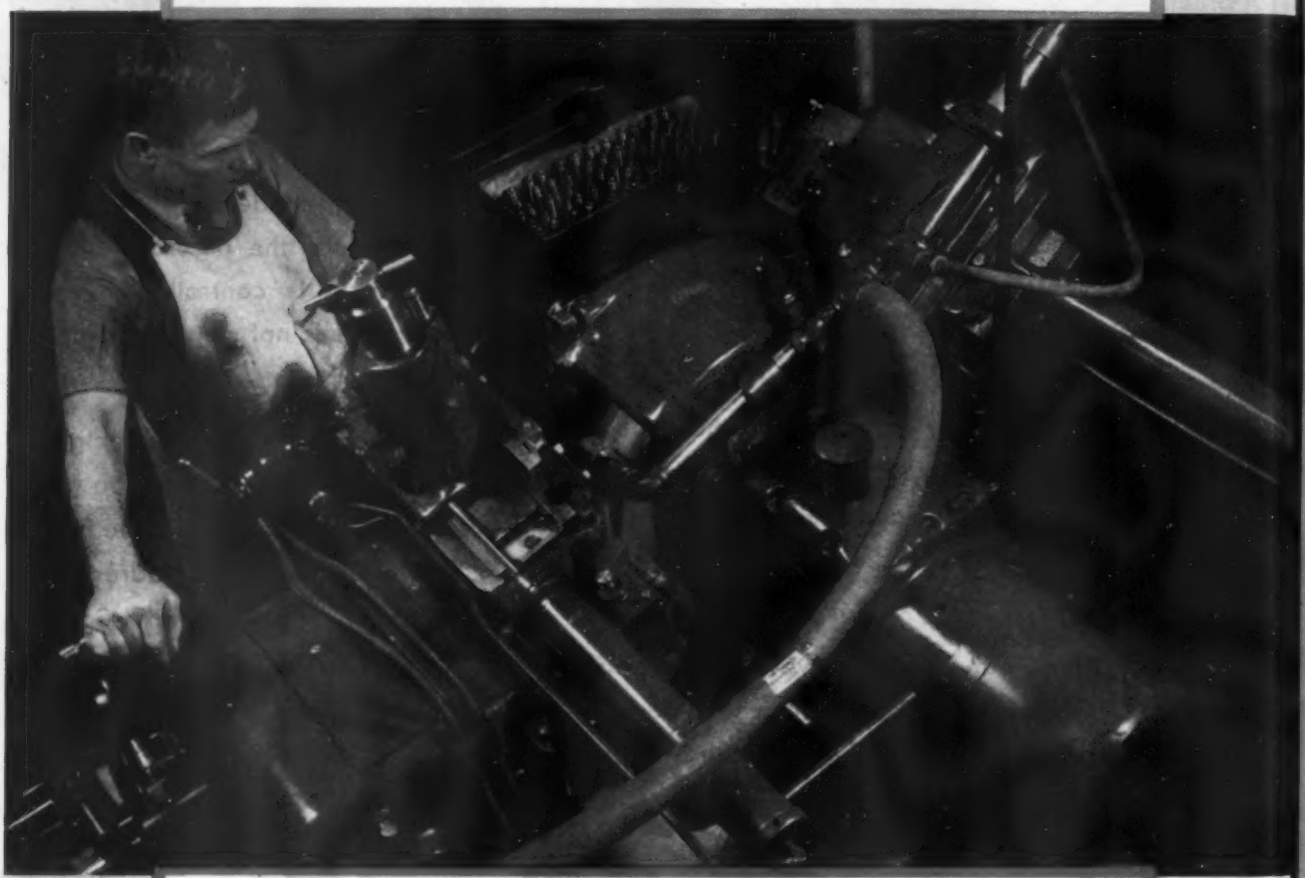
So make sure your Gear Shaper gives you all this extra value it is built to give. It is normally "the busiest machine in the shop." Write for literature. Address: The Fellows Gear Shaper Company, Springfield, Vermont—or 640 West Town Office Bldg., Chicago 12, Ill.—or 616 Fisher Bldg., Detroit 2, Mich.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



These widely differing parts were all ground on a CINCINNATI *No. 2 Centerless Grinder. Average quantities range from 25 to 500 pieces.*



Close-up of a CINCINNATI *No. 2 Centerless Grinder set up for a typical infeed job. The Hydraulic Profile Truing equipment over the regulating wheel is especially desirable on machines used for small lot production.*

Keep on buying WAR BONDS

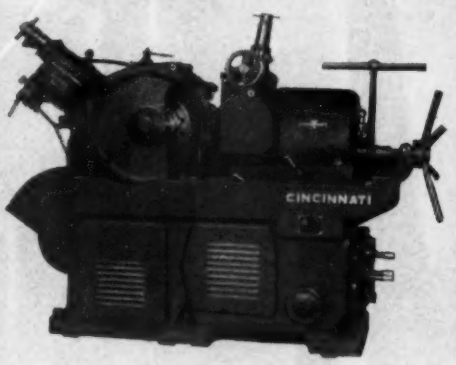
CINCINNATI

CENTER TYPE GRINDING MACHINES

SMALL QUANTITIES ECONOMICALLY GROUND

. . . on the Cincinnati Centerless

If, in your manufacturing processes you handle a variety of parts in small quantities, you can grind them economically on a CINCINNATI Centerless Grinding Machine. For lowest cost production, do these two things: 1) Group together all parts requiring a particular type of setup. For example, it takes less time to change from one thru-feed job to another than to change from a thru-feed to an infeed job. 2) Group all parts together by diameter. It takes less time to change the setup for a small difference in diameter than for a large difference. ¶ It will certainly be to your advantage to investigate the CINCINNATI Centerless for grinding a wide range of parts. A more complete story of economical small parts production may be obtained by writing for "Principles of Centerless Grinding," publication G-503-1.



CINCINNATI No.2 Centerless Grinder. Catalog G-456-2 contains complete specifications. Copy sent on request. For a brief description of this machine, look in Sweet's Catalog File for Mechanical Industries.

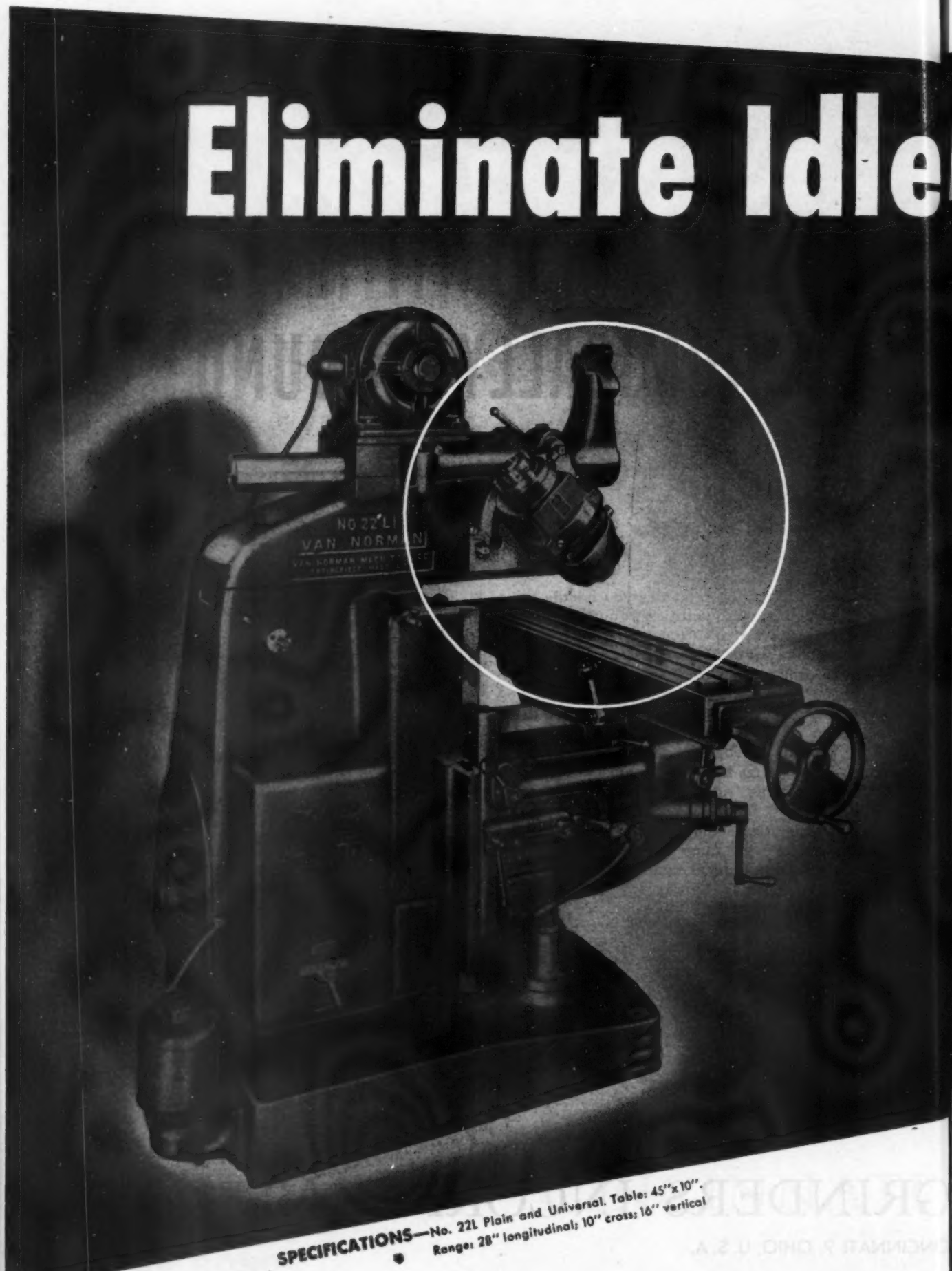
CINCINNATI

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Eliminate Idle M



SPECIFICATIONS—No. 22L Plain and Universal. Table: 45"x10". Range: 28" longitudinal; 10" cross; 16" vertical

eMachine Time

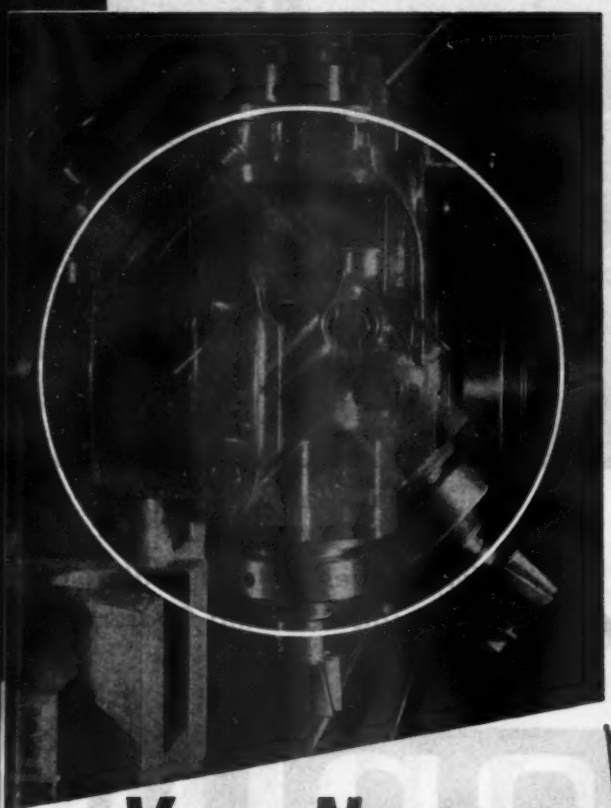
CAUSED BY WORK RESET-UPS

★ ★ ★ ★ ★

WITH VAN NORMAN RAM-TYPE UNIVERSAL MILLERS

Repeated set-ups of a work-piece through successive milling operations result in production loss because the machine is idle and non-productive while the operator makes the reset-up. Added up, this idle time often exceeds the machines productive time.

You can minimize idle machine time and increase production with a Van Norman Ram-type Universal Miller . . . the milling machine that gives you horizontal, angular, or vertical milling without changing the set-up or moving the work to another machine. Not only does this enable you to complete most jobs with the original set-up, but it also eliminates errors and subsequent work spoilage that very often results with continuous reset-ups.



Adjustable Cutterhead Mills at any Angle

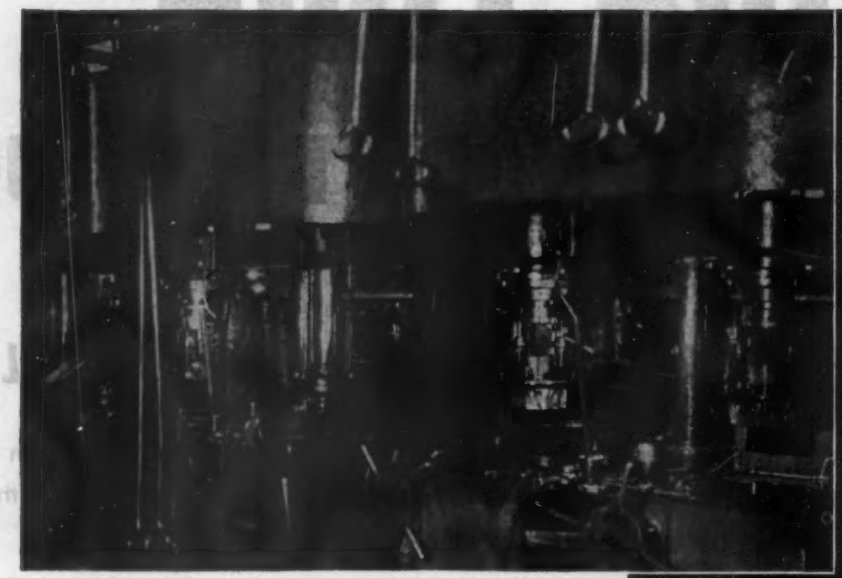
The Van Norman Swiveling cutterhead, mounted on a sliding ram, is quickly and easily moved to any desired cutting position between horizontal and vertical. Three heavy clamping bolts hold the cutterhead rigidly in position for precision milling. Hardened stops, accurately set at the factory, are provided for 0° and 90° positions of the head. Angular positions are indicated on an easily readable dial, graduated in degrees.

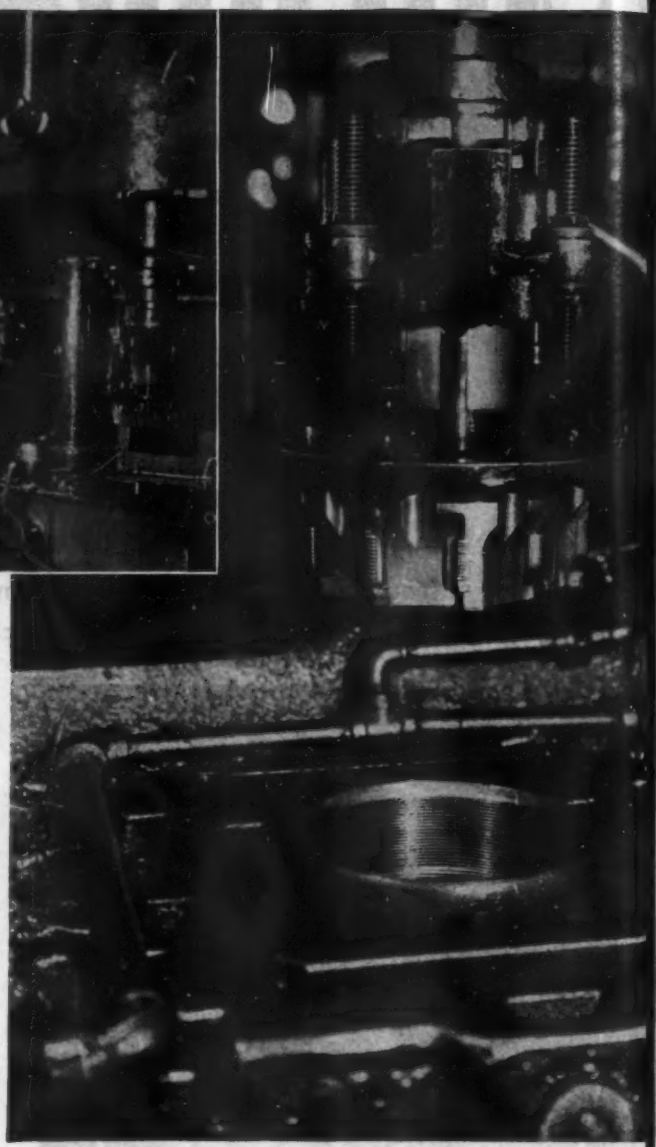
ARMY E NAVY

Van Norman Milling Machines

VAN NORMAN COMPANY, SPRINGFIELD 7, MASS.

LANDIS Receding Chaser Collapsible Taps Assure Accurately Tapered Thread





Manufacturers of oil well tubular products employ Landis Receding Chaser Collapsible Taps almost exclusively for producing their internal threads. The sturdy, rigid construction, plus the receding chaser feature which withdraws the chasers as the tap advances into the work, and the positive ratchet size adjustments of the LANDIS Receding Chaser Tap, assure tapered threads of unusually fine accuracy. Threads are produced well within A.P.I. tolerance specifications.

Write for descriptive literature cover Landis Receding Chaser Taps.

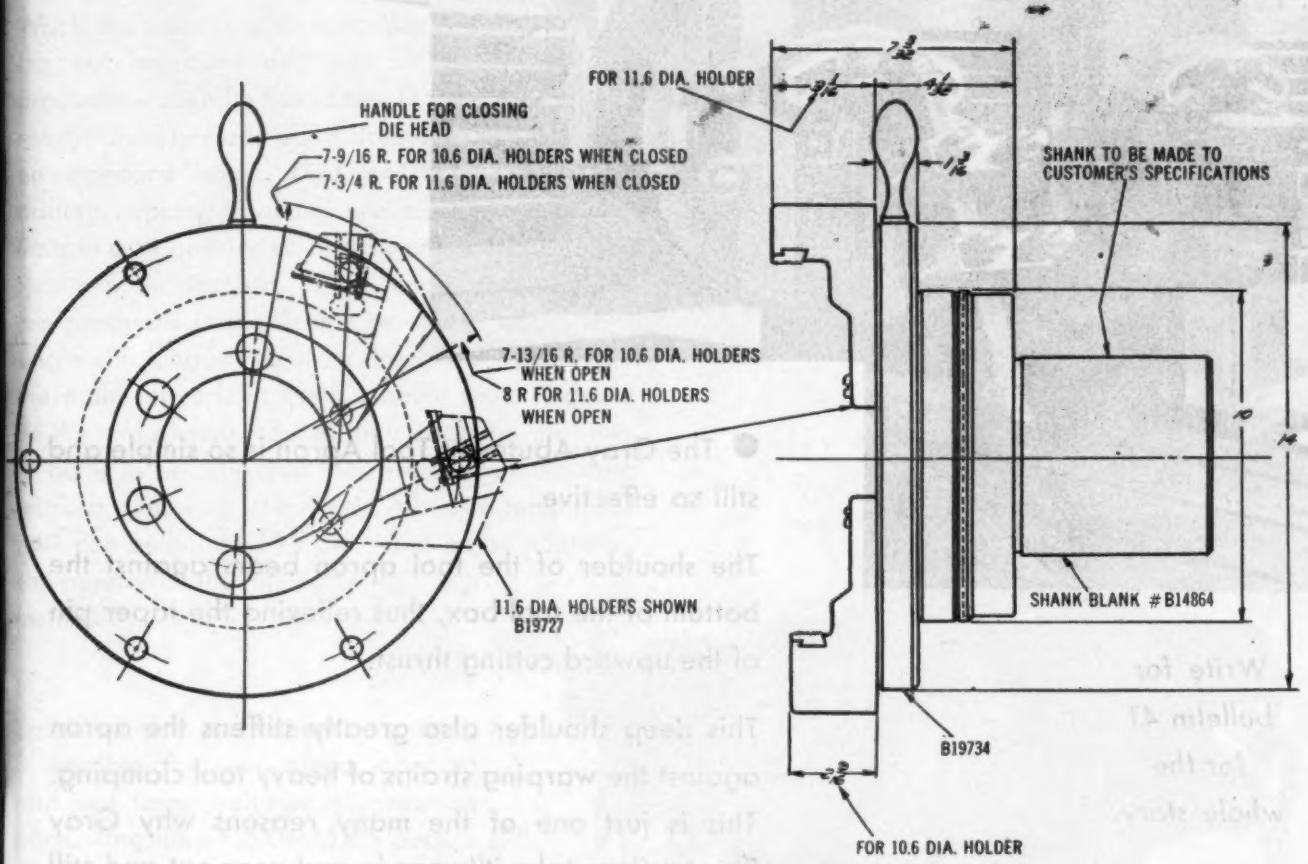
LANDIS

A Good Mechanic Knows and Cares For His Machine

LANDIS REG. U.S. TRADE-MARK PAT. OFF. THREAD TIPS

In the Interest of Efficiency, Better Workmanship and Higher Production

40 AXX LANDMATIC FOR THREADING LARGE DIAMETER, FINE PITCH, SHORT THREAD LENGTHS


FOR 11.6 DIA. HOLDER
HANDLE FOR CLOSING DIE HEAD
7-9/16 R. FOR 10.6 DIA. HOLDERS WHEN CLOSED
7-3/4 R. FOR 11.6 DIA. HOLDERS WHEN CLOSED
SHANK TO BE MADE TO CUSTOMER'S SPECIFICATIONS
7-13/16 R. FOR 10.6 DIA. HOLDERS WHEN OPEN
8 R FOR 11.6 DIA. HOLDERS WHEN OPEN
11.6 DIA. HOLDERS SHOWN B19727
SHANK BLANK # B14864
B19734
FOR 10.6 DIA. HOLDER

DIE HEAD IS OPENED BY STOPPING THE FORWARD TRAVEL OF THE TURRET, AND ALLOWING DIE HEAD TO PULL OFF. PULL OFF MOVEMENT IS 5/32

SMACHINE CO. WAYNESBORO PENNA. U.S.A.

This simple GRAY feature assures continuous accuracy

● The Gray Abutment Tool Apron is so simple and still so effective.

The shoulder of the tool apron bears against the bottom of the tool box, thus relieving the taper pin of the upward cutting thrust.

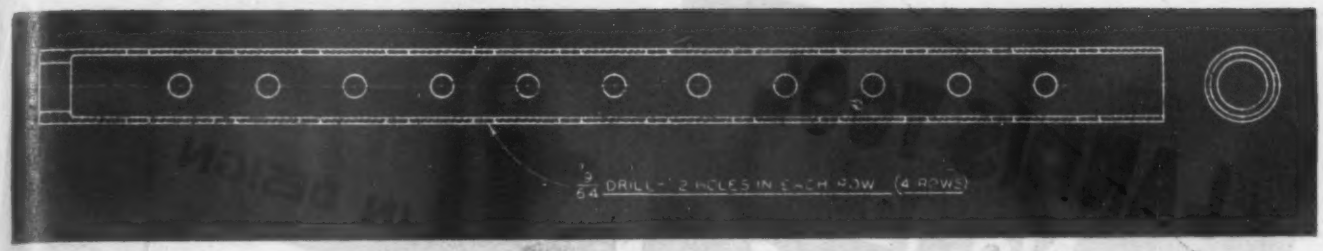
This deep shoulder also greatly stiffens the apron against the warping strains of heavy tool clamping. This is just one of the many reasons why Gray Planers "can take it" year in and year out and still retain their accuracy.

Write for bulletin 41 for the whole story.

GRAY

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE—Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines

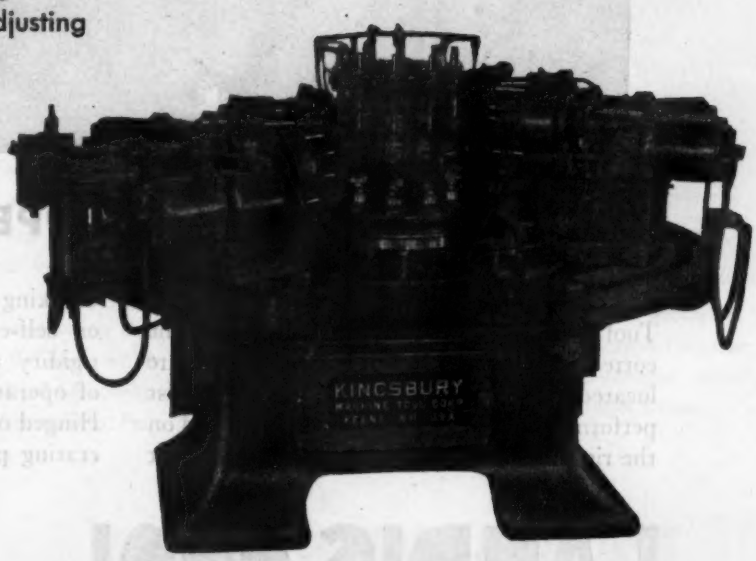


FLEXIMATIC

by KINGSBURY

JOB ...SPEEDING NAVAL ORDNANCE PRODUCTION!

When the call came for machines capable of turning out munitions and aircraft parts at mass-production speeds, Kingsbury FLEXIMATICS were ready! Quickly made up of standard units mounted on standard bases. FLEXIMATICS can perform drilling, tapping, reaming and many other operations in **any** position or at **any** angle on **any** part that can be chucked. For example, all 48 holes are produced in the flash tube shown above in a single chucking of the work. Each work holder on the main turret is in itself a turret which indexes as the mai nturret indexes, thus enabling the rows of holes to be drilled at four positions on the tube without removing the work. Various lengths of tube can be handled by the machine by adjusting the position of the top clamping member.



Speeding war production by making it possible for semi-skilled labor to turn out large volumes of precision parts, Kingsbury FLEXIMATICS possess the added advantage of FLEXIBILITY that permits quick, easy changeovers to meet changes in design or machining requirements.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

LANDIS TOOL No. 12 CENTERLESS GRINDER

LEADS IN DESIGN

LEADS IN APPEARANCE

The clean, modern lines of the new Landis Tool Centerless Grinder are the result of the correct functional design. Operating parts are located exactly where they should be for best performance. The grinding wheel is located on the right of the operator for more convenient checking of the work. Driving motors mounted on self-contained wheel bases give greater rigidity and ease of adjustment. Enclosure of operating parts protects against damage. Hinged openings permit easy access to all operating parts for inspection or maintenance.

LANDIS TOOL *Precision Grinders*

LANDIS TOOL COMPANY

LEADS IN PERFORMANCE

LEADS IN APPEARANCE

LEADS IN PERFORMANCE

New, modern features make possible the superior finishes and high production that give the Landis Tool Centerless leadership in performance. These include: Faster stock removal to close limits and fine finish by rigid support of work in guide that extends up to center line of regulating wheel spindle • Simple rheostat controlled adjustable speed drive • Screw traverse adjustment of regulating wheel base for rapid, accurate wheel alignment • Tilting regulating wheel base for through feed grinding • Swiveling regulating wheel base for grinding tapers • Quick, easy setup of single work rest for parallel or tapered work • Single, convenient valve at operator position controls coolant for grinding and dressing.

Closeup of grinding wheel shows hydraulically controlled diamond dresser with earphone to determine when diamond is in contact with wheel.

LEADS IN DESIGN

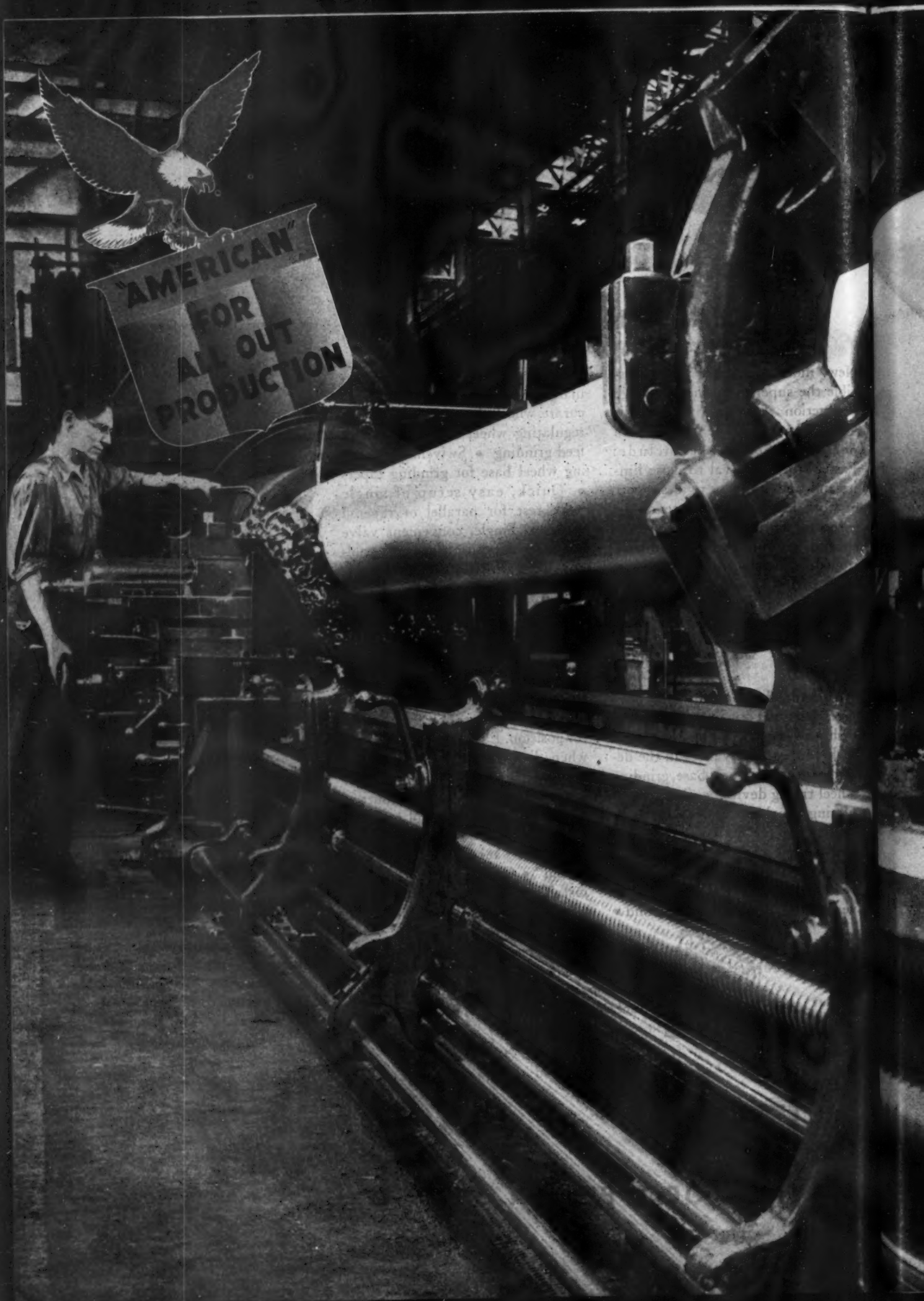
New and advanced features have given LANDIS TOOL immediate leadership in centerless grinders. These include specific advances in the design of grinding wheel base, grinding wheel truing device, work rest, regulating wheel and hydraulic system, lubricating system, coolant system and electric controls. Outstanding are: Wheel dressed at exact point of work contact by hydraulic traverse of rigidly mounted diamond • Hydraulically controlled grinding wheel dresser accessible from operator position. Earphone to determine when diamond is in contact with wheel • Conveniently grouped main controls with master stop button for instantaneous control • Three position selector switch controls machine for "setup", "dress" and "grind" • Grinding wheel base adjustable to compensate for wheel wear and varying work diameter.

16

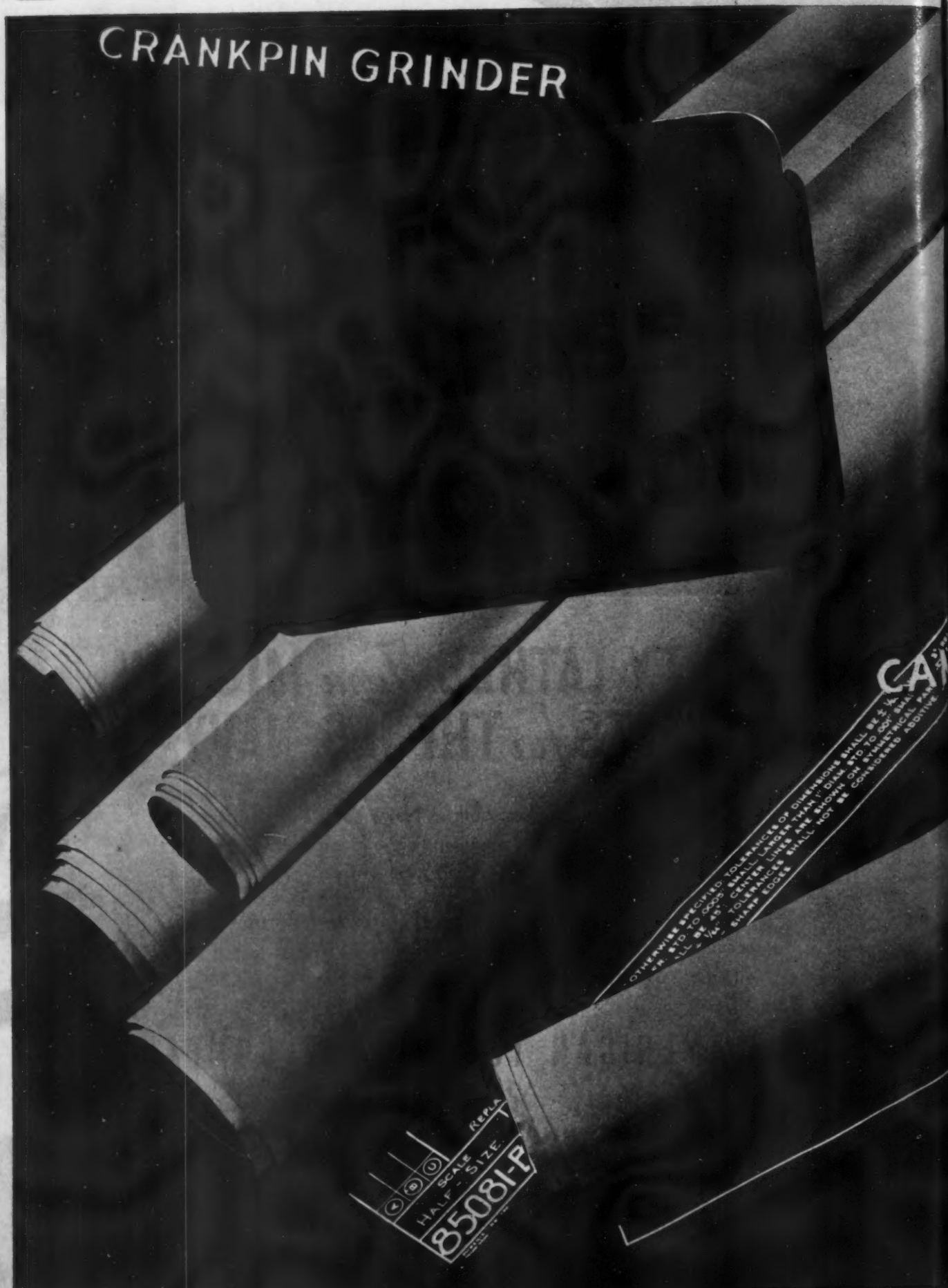
For complete information on the No. 12 Centerless Grinder, write for a copy of Catalog T44. Landis Tool Company, Waynesboro, Pa.

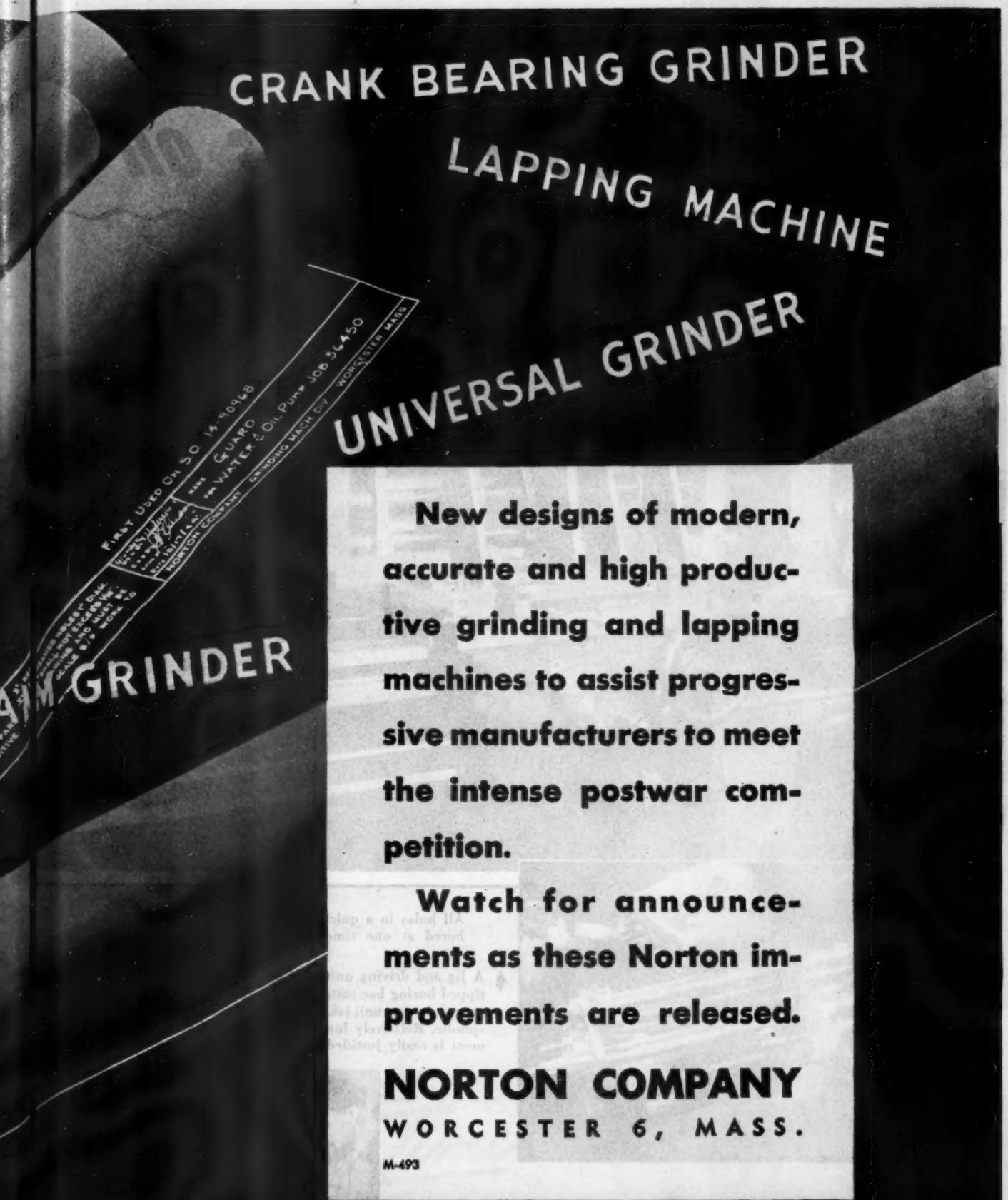
LANDIS TOOL Company

WAYNESBORO, PENNA.


"AMERICAN"
FOR
ALL OUT
PRODUCTION

MIGHTY LATHES Turn MIGHTY
SHAFTS for THE U.S. NAVY
"AMERICAN" 48" Lathes, both in Navy Yards and Contractors' Plants, are adding their enormous power and productive capacity to the building of our "two-ocean" Navy.
"AMERICAN" Lathes, from 14" to 48" sizes, are fast—powerful—accurate. They are meeting the challenge of War demands like all true AMERICANS.
THE AMERICAN TOOL WORKS COMPANY
Lathes - Radials - Shapers
CINCINNATI, OHIO, U. S. A.


CRANKPIN GRINDER
HALF - SIZE
85081-P



New designs of modern, accurate and high productive grinding and lapping machines to assist progressive manufacturers to meet the intense postwar competition.

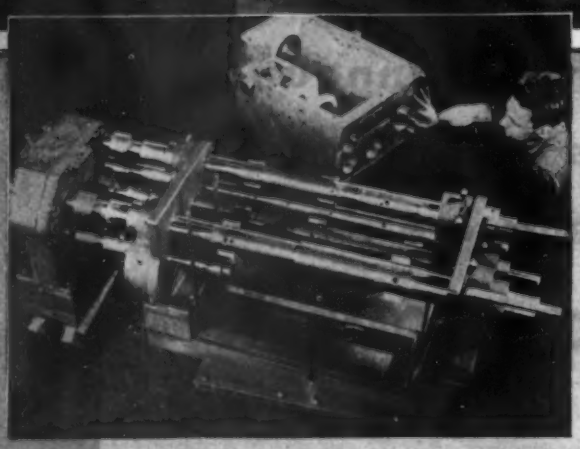
Watch for announcements as these Norton improvements are released.

NORTON COMPANY
WORCESTER 6, MASS.

M-493

Cost saving tips on . . In

All holes in a quick-change gearbox casting are line-bored at one time on this small Monarch Lathe.



A jig and driving unit, five boring bars and carbide-tipped boring bar cutters, bore a lathe headstock. The geared driving unit takes its initial drive from the lathe spindle. Relatively low cost of jig and fixture equipment is easily justified by time savings and accuracy.

Almost unbelievable accuracy in duplication of machining is obtained by this method of multiple inside turning of headstocks for Monarch 16" Toolmaker's Lathes. Each headstock fits in the jig on a V and flat, for accurate locating. Time saving is augmented by faster assembly because of accuracy of the boring.

Inside Turning"

● These examples of *inside turning* are from actual production of Monarch Lathes in our own plant. We have proved beyond any doubt the time-saving and cost-saving advantages of these methods. Especially important is the accuracy gained from line boring all holes in the same plane at one time.

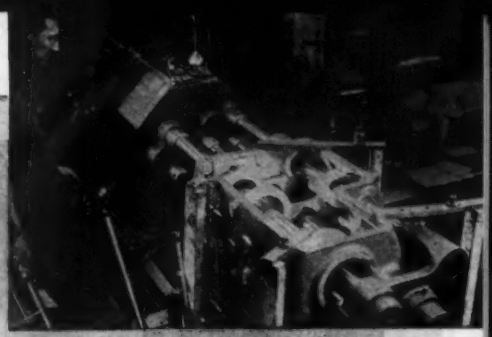
The extent of these applications is almost unlimited, as has been proved by experience in our customers' plants. Even small-lot runs are justified because of the relatively low cost of jigs and fixtures, compared to the time saved and the accuracy of production.

Many other examples are shown in our bulletin No. 190—"*Inside Turning with Monarch Lathes*" which we'll gladly send on request. Or, our engineers will study your work and furnish tooling suggestions and production time and accuracy estimates. Address us at Sidney, or at any of the factory branches named below.

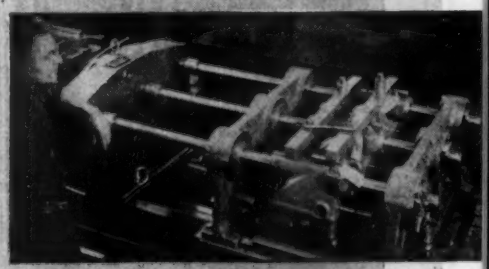
THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

FACTORY BRANCHES:
622 West Washington Blvd., Chicago 6, Ill. — 10465 Carnegie Ave., Cleveland 6, Ohio
801 Fisher Bldg., Detroit 2, Mich. — 635 Industrial Office Bldg., Newark 2, N. J.
512 Empire Bldg., Pittsburgh 22, Pa.
Representatives in Principal Cities.

Monarch Saves Time



This Monarch 16" Lathe with platen-type carriage is boring, at one time, fifteen holes in a headstock for this same size and type of lathe. The operator's platform is an extension of the lathe carriage, with operating levers conveniently extended upward. Rough and finish boring are completed in one setting.

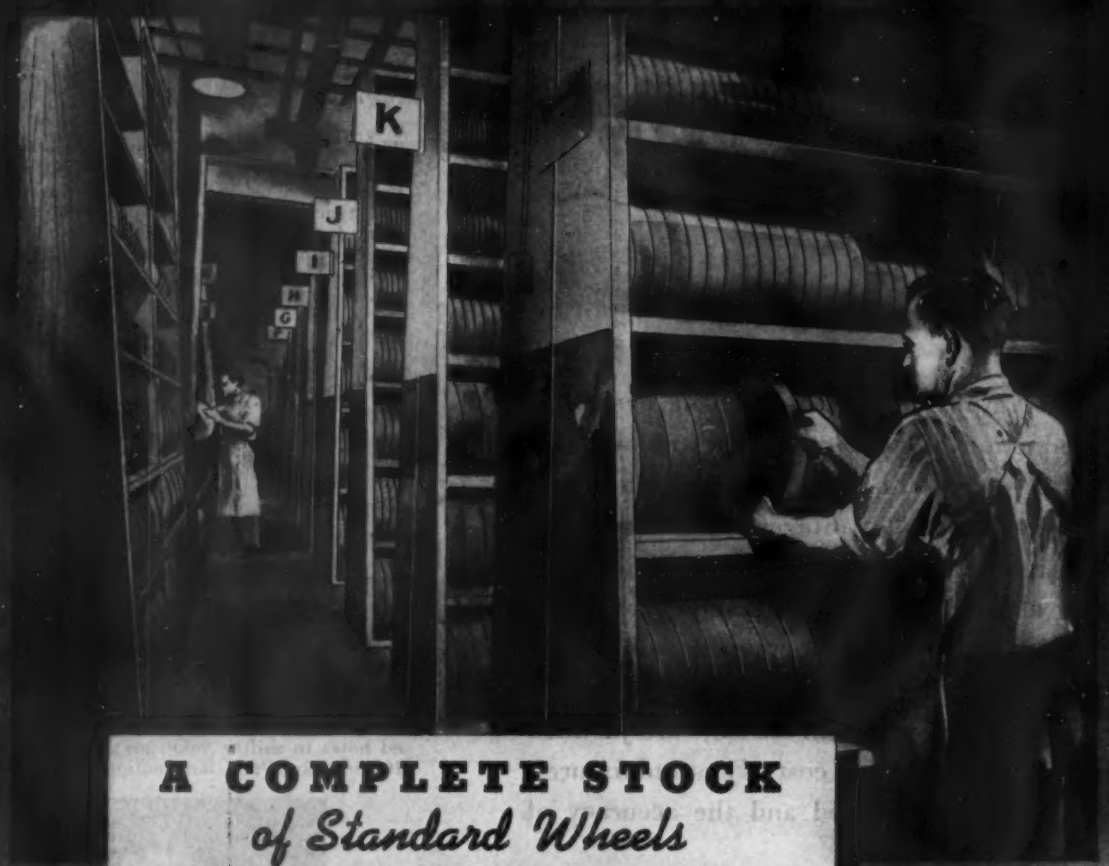


Three tailstocks are being line-bored here, at one time, in the time ordinarily required to machine one.

Even inexperienced operators obtain splendid performance in boring perfectly aligned holes in shifter yokes on this Monarch 10" Sensitive Precision Toolmaker's Lathe.

Double-headed precision boring machine inside-turns holes for antifriction bearing support studs in a Monarch taper attachment shoe. Fixture holds two pieces permitting operator to reload while boring. Headstocks are those used on Monarch 10" Sensitive Precision Toolmaker's Lathe, with ball-bearing mounted spindles operating at speeds up to 4,000 rpm or higher.

THE WHEELS OF INDUSTRY



A COMPLETE STOCK
of Standard Wheels
FOR YOUR EMERGENCY USE

SEND FOR THIS FREE BOOK

The reprinted No. 44 Sterling Catalog is now ready for distribution. It contains full information on new Sterling Wheel markings—important data you should have for ordering the "Wheels of Industry." Your copy will be sent upon request.

Do you need a grinding wheel in a hurry for a standard job? Nine chances out of ten, we have what you want on the shelves of our stockroom racks. Experience has taught us what wheels are in greatest demand . . what combinations of grains, bonds, structures, sizes and shapes move most frequently throughout industry.

Our carrying a full stock of standard grinding wheels saves you many days on delivery and also makes certain you obtain the type of wheel best suited to your needs. Tested by use on hundreds of similar jobs, these "Wheels of Industry" can be used with confidence on yours.

Because of the many thousands of combinations, it is impossible to carry a complete stock of special items, but Sterling is prepared to provide fast service on deliveries of all wheels. New equipment to speed up production has been in operation for sometime, resulting in unusually quick delivery, regardless of the type wheel needed.

Sterling quick delivery and high quality, plus unusual engineering cooperation are worthy of your attention whenever you need wheels immediately or on regular schedule. Let us know your needs.

• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

It is reported that . . . . . .

So tough is one new kind of glass that a searchlight lens made of it resists the heat of an 800 million candlepower lamp even though snow falls on the outside. *"Tuf-flex", Libby-Owens-Ford.*

get ready with **CONE** for tomorrow

Thermite (as used in incendiary bombs) has been applied to the demolition of metal structures. *McGraw-Hill Overseas Digest.*

get ready with **CONE** for tomorrow

A new magnetic floor sweeper for factories looks like a lawn mower and picks up nails, scrap, small parts, and tools. *Stearns Magnetic Mfg. Co., Milwaukee.*

get ready with **CONE** for tomorrow

One of our aircraft manufacturers has complete plans for fitting a new fuselage, with luxurious interior, to the wings and engines of war-time bombers. *Consolidated Vultee Aircraft Corporation.*

get ready with **CONE** for tomorrow

In a newly-designed twelve-story parking garage, a single attendant can put away or bring out any one of 110 automobiles by merely pushing a button. *Park-O-Mat Co., Los Angeles.*

get ready with **CONE** for tomorrow

Plans are well advanced for annual trade fairs, on the European plan, in several American cities. *Bureau of Foreign and Domestic Commerce, Washington, D. C.*

get ready with **CONE** for tomorrow

Two hundred police chiefs recently witnessed a demonstration of a tiny radio receiver about the size of a pack of playing cards. *Hytron Corporation, Salem, Mass.*

get ready with **CONE** for tomorrow

The "Axonograph" is a device that photographically produces an axonometric drawing directly from a blueprint. *Glenn L. Martin Co., Baltimore.*

One manufacturer of electric appliances is already displaying his post-war models in order to gauge public tastes and preferences. *Proctor Electric Co., Philadelphia.*

get ready with **CONE** for tomorrow

"Fly-it-yourself" service is being planned on a basis similar to that of the familiar rented automobile service. *R. S. Robie, Boston.*

get ready with **CONE** for tomorrow

A "slot-machine" mail box accepts payment, stamps a letter and holds it for collection. *"Mailomat", Pitney-Bowes, Stamford, Conn.*

get ready with **CONE** for tomorrow

A new molding plastic is non-organic and will stand heat to 420° centigrade. *Mycatex Corp., Clifton, N. J.*

A new chemical, when sprayed on the soil of gardens, is absorbed by the plant and kills many insects and fungi. By this means potato crops are said to have been increased as much as 40 bushels per acre. *Rohm and Haas Co.*

get ready with **CONE** for tomorrow

A prominent scientist states that he believes that a temperature of absolute zero (—273.1° C.) may soon be attained. *Prof. Peter Debye, Cornell Univ.*

get ready with **CONE** for tomorrow

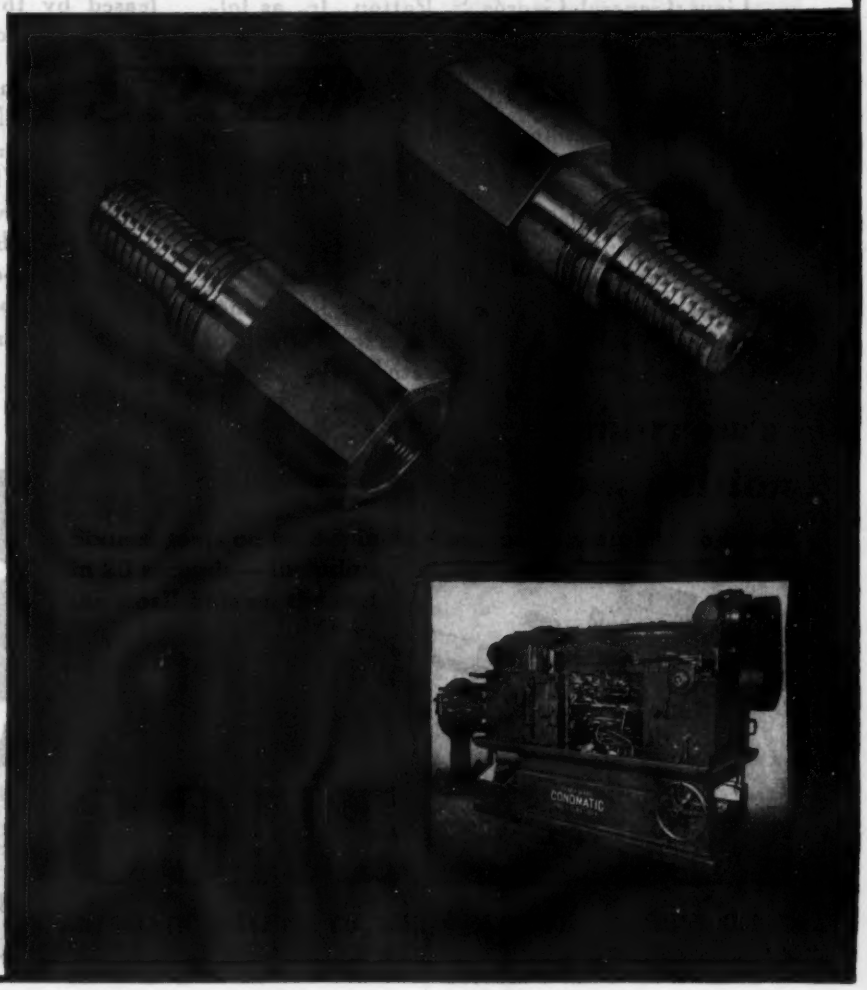
The new space-saving square milk bottles are already in use by one dairy. *Sanitary Farm Dairies, Cedar Rapids, Iowa.*

get ready with **CONE** for tomorrow

An electric motor has been built that develops 30 horsepower and weighs only 57 pounds. *General Electric Co.*

get ready with **CONE** for tomorrow

Paper forms for poured concrete are being used. *Sonoco Products Co., Hartsville, S. C.*

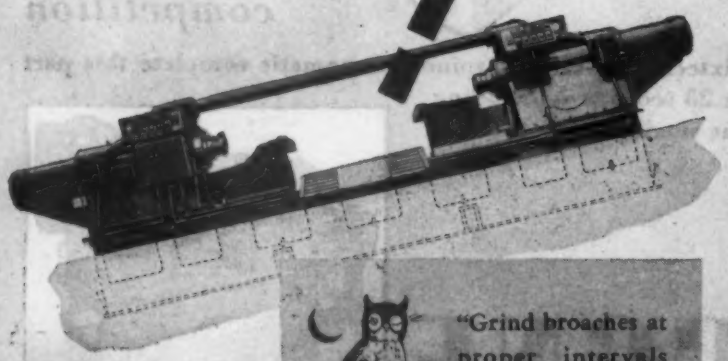


Putting "Hep" IN THE "CATS"!

NEWSWEEK of August 28 reports of Lieut.-General George S. Patton, Jr., as follows: "If he had to choose between tanks and bulldozers for an invasion he would choose road-building equipment every time." More than a construction machine, the bulldozer has been a powerful factor in winning many battles.

To quickly, efficiently fit axle shafts and bearing cups into bulldozer transmission cases, *American* engineers designed a special horizontal assembly press. A conveyor line brings the cases to the machine and removes them after operations are completed. The part is stopped, locked in position, pressed, and released by this hydraulically operated, push button controlled machine.

This is another example of how the American Broach and Machine Company help leading manufacturers increase output of vital war materials. When the war job is done, *American's* complete service of machines, tools, and engineering will be available to speed manufacture of civilian goods. Let *American* engineers show you how broaching or special machinery can solve your production problems. Write today for details.



"Grind broaches at proper intervals to prevent loss of broach life."

MEMBER BROACHING TOOL INSTITUTE

American BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO.

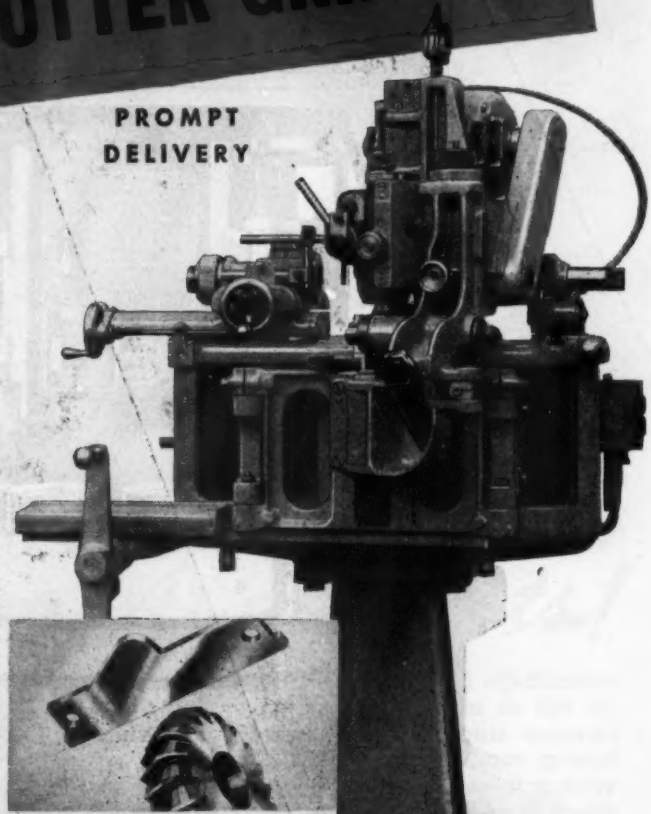
Keep 'em Sharp

with the P&W CONTOUR CUTTER GRINDER

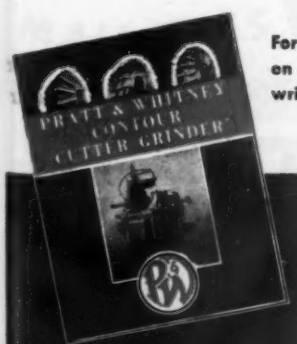
PROMPT DELIVERY

For milling odd surfaces, shaped contour cutters are in a class by themselves. They do more work, better work . . . give a far better finish. And with the greatly increased preference for these cutters has come an increased demand for Pratt & Whitney Contour Cutter Grinders.

No matter how intricate, this machine sharpens contour cutters *swiftly* and with *absolute accuracy*. Each tooth on a cutter is ground separately — to the identical contour and center distance of all other teeth. Thus, each tooth will take its full share of the cut when milling, will work more smoothly and efficiently. P&W can give immediate delivery on the Contour Cutter Grinder. And P&W can also supply contour cutters shaped to your specifications.



Perfect Duplication. A steel former plate shaped to the desired contour of the cutter is clamped into the machine. A former pin contacts this contour, causing the grinding wheel to duplicate this contour along the periphery of each cutter tooth.



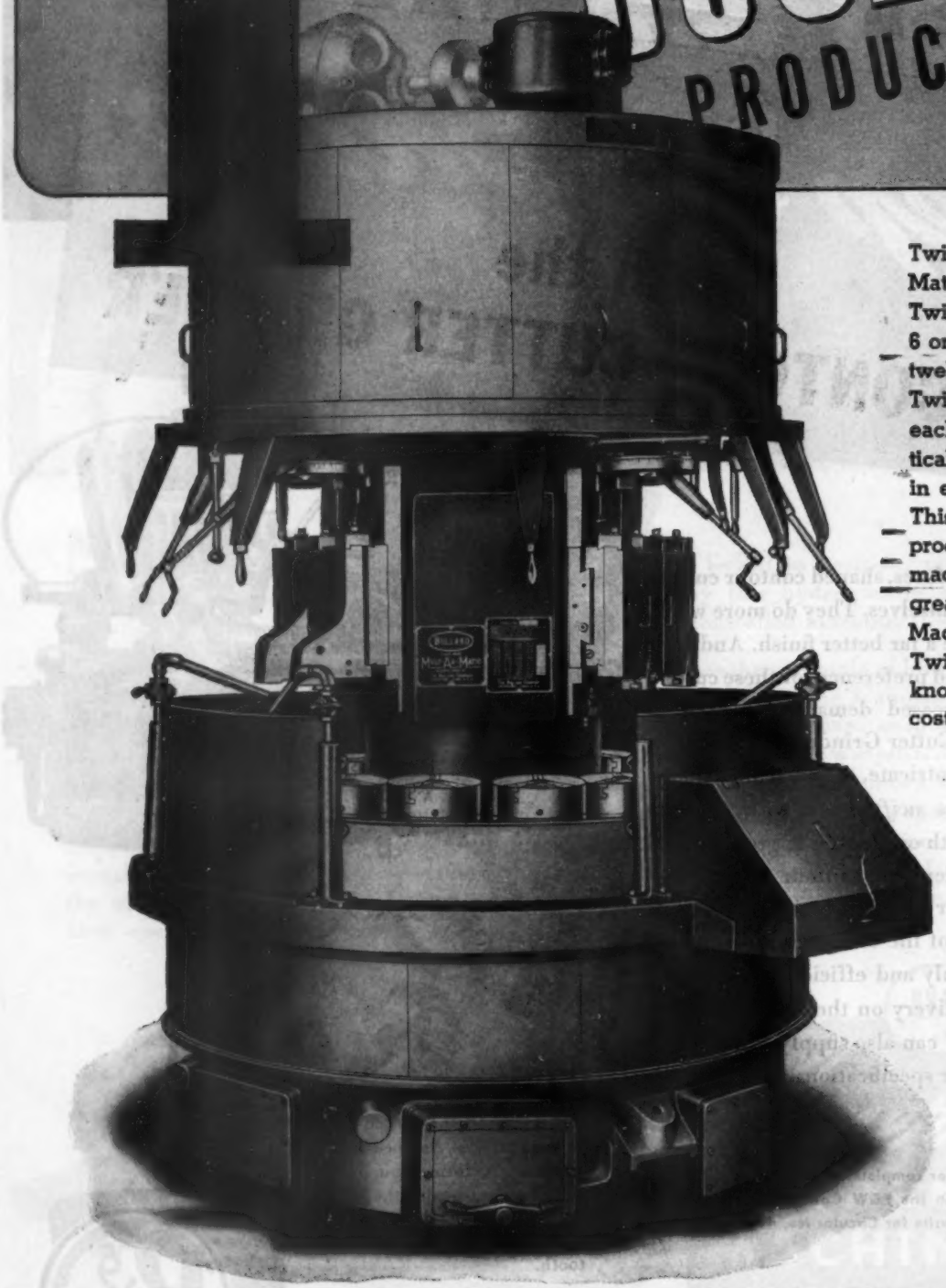
For complete details and specifications on the P&W Contour Cutter Grinder, write for Circular No. 476.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

West Hartford 1, Conn.

1 MACHINE DOUBLES PRODUCTION!



Twin Spindle Mult-Au-Matics—The Faster Method. Twin spindles at each of the 6 or 8 stations give a total of twelve or sixteen spindles. Twin tooling on the head at each station performs identical operations on the work in each of the twin chucks. This naturally doubles the productive output from one machine at only a slightly greater investment. One Machine—One Operator—Twice the Volume. That's knocking down production costs.

Write Bullard for details. Circular TR-DF-1.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

HEAVY DUTY UNIVERSAL
Heavy duty angular milling in all planes. (Bulletin No. 106).
CIRCULAR TABLE
Milling circles or cams, gear cutting, high speed continuous milling, etc. (Bulletin No. 108).
VERTICAL HEAD
Converts horizontal to vertical machine, retaining identical spindle characteristics. (Bulletin No. 109).
VISES
Standard and Heavy-Duty, plain and swivel types. Adaptable to special jaws to save fixtures. (Bulletin 117).
SLOTTER
Keyseating, broaching, general slotting, tool and die making, etc. (Bulletin No. 107).
HI-SPEED UNIVERSAL
High speed angular milling in all planes. (Bulletin No. 113).
DIVIDING HEAD
Precision indexing, spiral cutting mechanism and chuck jaws available. (Bulletin 119).

Cut Production Costs WITH KEMPSMITH *STANDARD Milling Attachments!*

ARBORS and full line of standard accessories carried in stock. Adaptable to ANY make of milling machine equipped with standardized spindle. (Bulletin No. 116).

When expensive, "cost-upping" special machines or special attachments are not available, why not use standard equipment that can do the job just as well or even better? Kempsmith Standard Attachments mounted on a standard milling machine provide VERSATILITY for those special equipment jobs . . . at the same time retaining the high degree of rigidity and precision characteristic of Kempsmith machines for more than 56 years. It will pay you to investigate. Write for bulletins.

MAIL THIS COUPON TODAY

THE KEMPSMITH MACHINE CO.
1823 South 71st Street, Milwaukee 14, Wis., U.S.A.
Please mail me copy of bulletins No.....
Name.....
Title.....
Firm.....
Address.....

KEMPSMITH

Precision Built Milling Machines Since 1888

"Put it on the Blanchard"

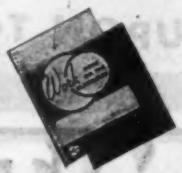
...GET THESE ADVANTAGES

Production ✓
Adaptability ✓
Fixture Saving ✓
Operation Saving
Material Saving
Fine Finish
Flatness ✓
Close Limits

Grinding Aluminum Base Castings

These frail castings are ground on two sides flat and parallel on a No. 18 Blanchard Surface Grinder. They measure 23½" x 21½" x 11" and 5/32" stock is removed from each side. One piece is ground at a time, lightly held by clamps to a steel base plate which is magnetically held on the chuck. Two pieces, four surfaces, are finished per hour.

If you have work, large or small, that requires flatness, squareness, parallelism and fine finish, "put it on the Blanchard" for best and fastest results.



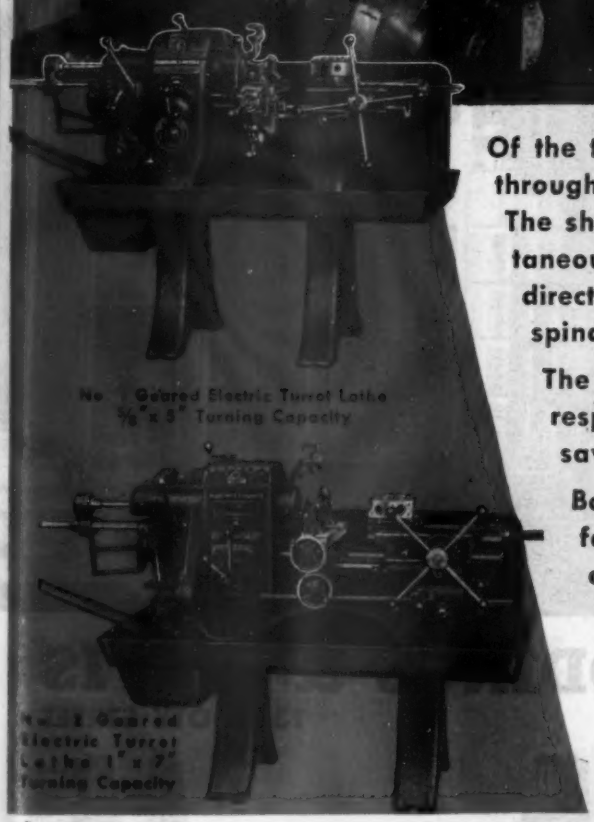
Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Production Time is Saved BY

SELECTING THE DESIRED SPINDLE SPEED QUICKLY AND EASILY



No. 1 Geared Electric Turret Lathe
⅝" x 3" Turning Capacity

No. 2 Geared Electric Turret Lathe 1" x 2" Turning Capacity

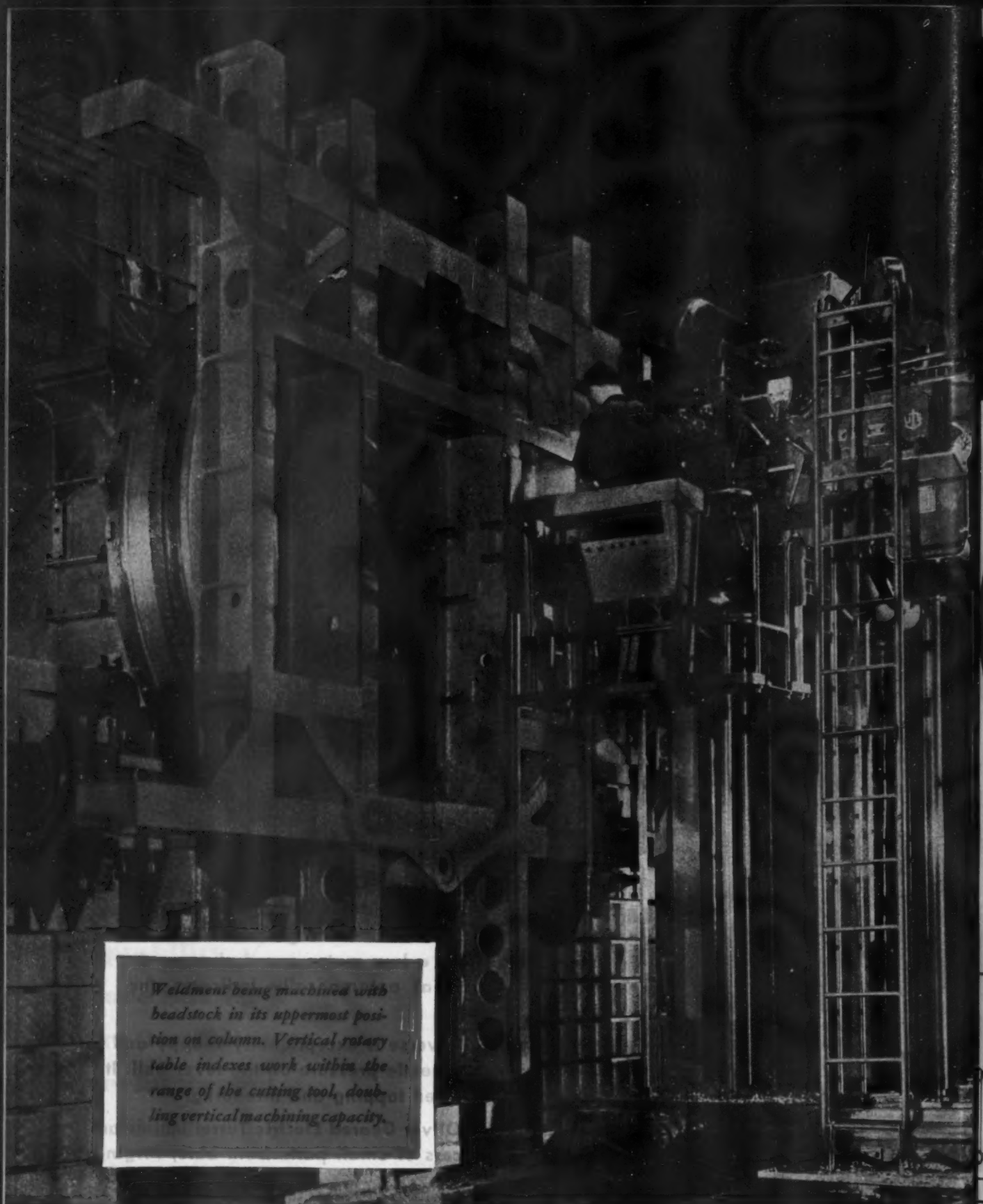
Of the twelve speed changes six are obtainable through sliding gears controlled by a single lever. The short lever by the left hand gives an instantaneous high and a low motor speed change. A direct reading dial automatically indicates the spindle speed.

The electrical reverse is exceptionally snappy and responds to a gentle pressure on the lever ball. It saves time when tapping and threading.

Bardons & Oliver Geared Electric Turret Lathes are fast producers of small parts from bars, forgings and castings.

We will gladly furnish complete descriptive matter on request.

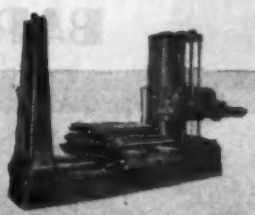
BARDONS & OLIVER, INC.
1133 WEST 9TH STREET • CLEVELAND 13, OHIO



Weldment being machined with headstock in its uppermost position on column. Vertical rotary table indexes work within the range of the cutting tool, doubling vertical machining capacity.

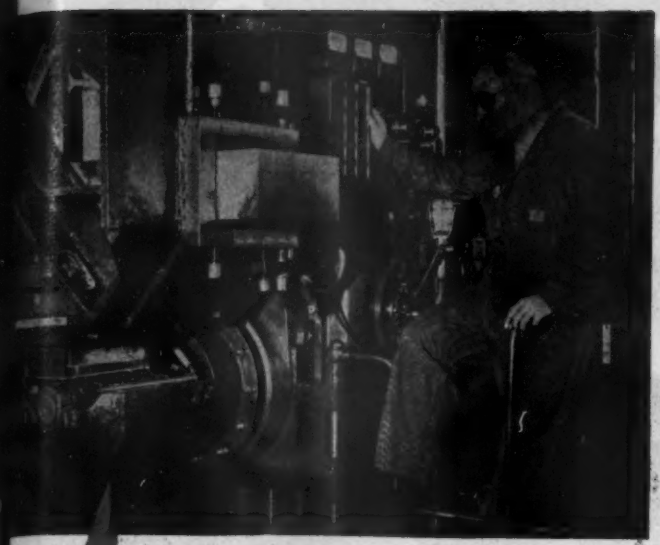
GIDDINGS & LEWIS

138 DOTY STREET



Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.



Slab milling ends of weldment. Work and holding fixture are easily indexed on the vertical rotary table into correct machining position.

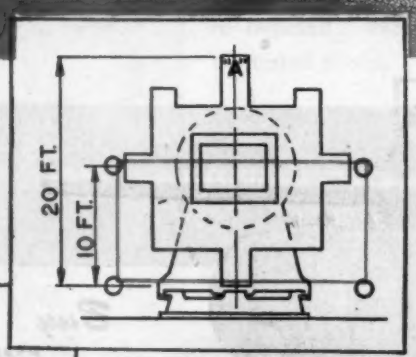
Power Driven Rotary Table Doubles Vertical Capacity of G.&L. Horizontal Boring Machine

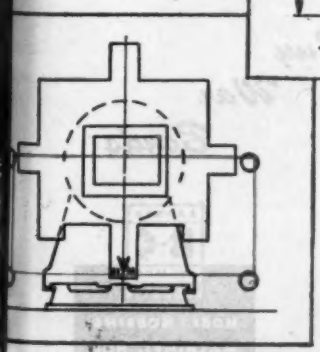
Machining this 20-foot weldment is accomplished by using a vertical table with only 10 ft. center height and a horizontal boring machine having but 10 ft. vertical headstock travel. Work is indexed to bring the top down where it is accessible for milling and other operations. Both work rotation and tool rotation are possible. Using the power rotary table, work may be turned and faced with stationary tools much the same as on a vertical boring mill or on a lathe. Then, work can be milled, bored, drilled and tapped with tools in a rotating spindle in the conventional manner. Again work can be generated by rotating a formed tool in the boring mill spindle, while the work is turned by the rotary table.

An operator of a vertical boring mill working on a piece 20 ft. in diameter is at least 10 ft. away from the cutting tool. The operator of a floor-type horizontal boring machine, shown here, rides on a platform attached to the machine headstock and is at all times immediately adjacent to the cutting tool.

It is a simple matter to increase the range of your own horizontal by equipping it with a vertical rotary table. If you are confronted with similar machining problems, it will be profitable to call on our engineers for assistance. There is no obligation for this help.

MACHINING A 20-FOOT WELDMENT... WITH 10-FOOT HEADSTOCK TRAVEL





FACE MILL—ONE SET-UP

1ST OPERATION—FACE MILL
Red frame denotes maximum working range of horizontal boring machine spindle, which is the area covered by the vertical and horizontal travel of the headstock and column.

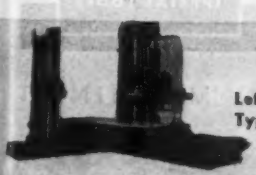
2ND OPERATION—INDEX 180°—FACE MILL
Top portion "A" has now been brought down within working range of spindle.

Additional Data

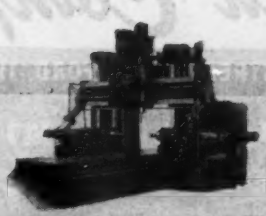
... covering the complete line of Giddings & Lewis machines and time saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin AM-114.

MACHINE TOOL CO.

FOND DU LAC, WIS.



Left: G. & L. Planer Type Machine.

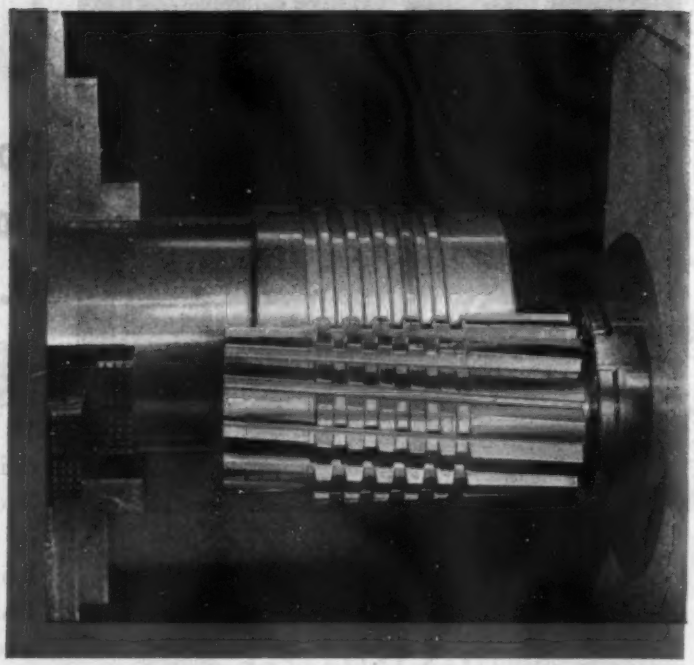


Left: G. & L. Multiple Head Type Machine.

Faster than previous method!

More dependable accuracy!

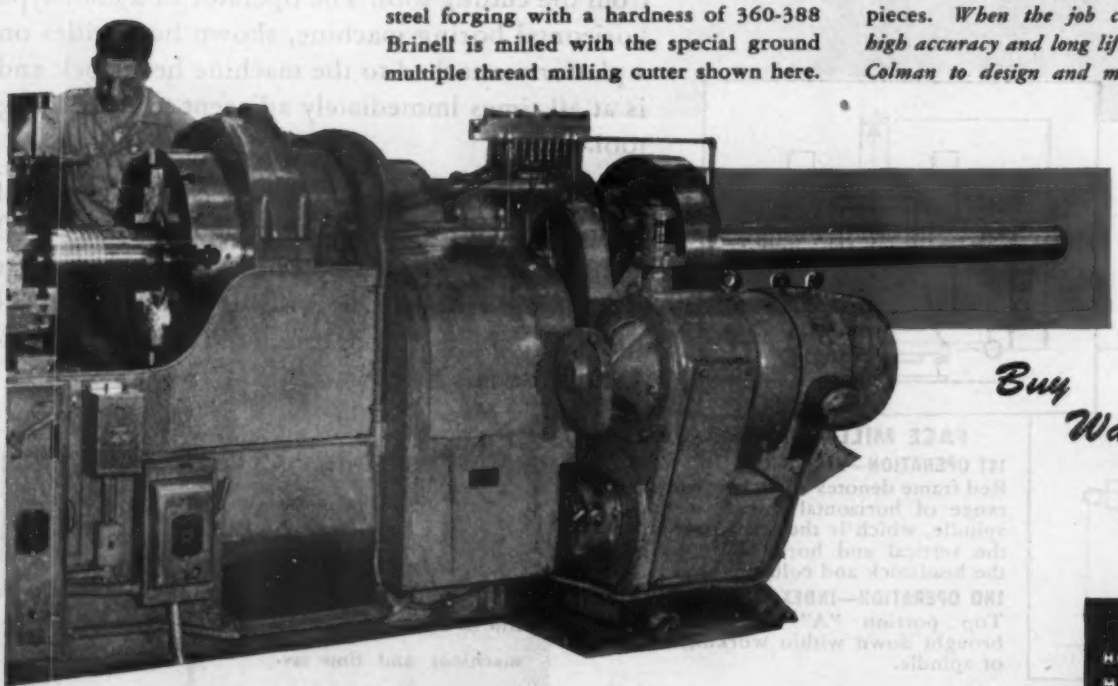
EXTERNAL THREADS ON TUBE OF 76MM. FIELD GUN CUT TO VERY CLOSE LIMITS AND FINISH USING A



BARBER-COLMAN THREAD MILL

Milling threads on 76 mm. gun barrels proved to be faster and more dependably accurate than was possible with the turning method formerly used. Barber-Colman engineers contributed cutter design to the improvements gained in this change of method. This gun barrel of tough alloy steel forging with a hardness of 360-388 Brinell is milled with the special ground multiple thread milling cutter shown here.

Accuracy limits call for ±.0005" cumulative on pitch and ±.00025" on depth, with excellent finish required. Two cuts are taken, removing .205" at 45 r.p.m. cutter speed and .055" at 25 r.p.m. Feed is 1.047" per min. Each cut requires 32 min. and the cutter is sharpened after each 49 completed pieces. *When the job calls for cutters of high accuracy and long life, count on Barber-Colman to design and make them for you!*



Buy War Bonds

BARBER B-C COLMAN

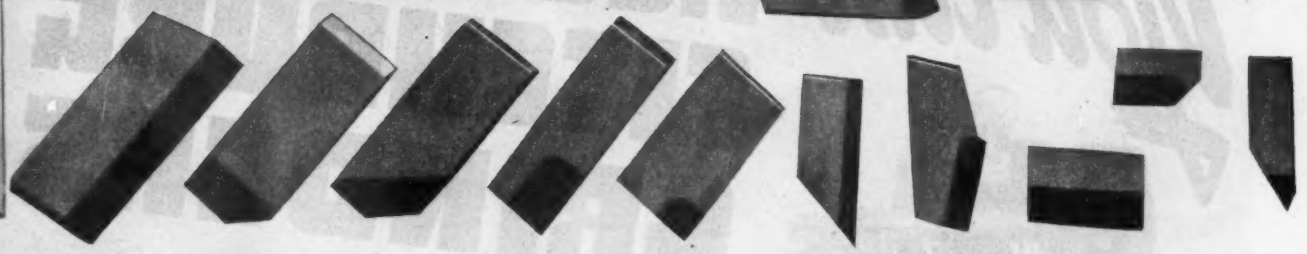
PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

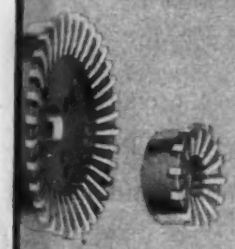
Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

Ingersoll

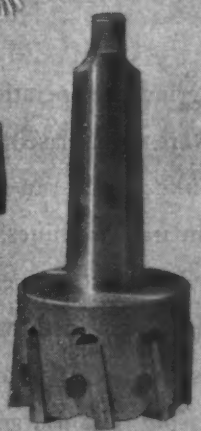


CARBIDE TIPPED CUTTERS



AY BLADE

GATIVE ANGLE
FACE MILL



NEGATIVE ANGLE
SOLID SHANK

UM DUTY
E MILL

FULL SIDE MILL

HEAVY DUTY CONE TYPE
FACE MILL

TYPE RQ

RED TOOTH
TTING

COMBINATION BORING
CHAMFERING, FACING

CYLINDER BORING

SHEAR CLEAR

NEGATIVE ANGLE
SLOTTING

Ingersoll specializes in the manufacture of carbide tipped cutters for milling and boring operations. The wide variety of standard Ingersoll designs covers most applications. Consult Ingersoll regarding increased production through use of carbide tipped milling and boring tools.

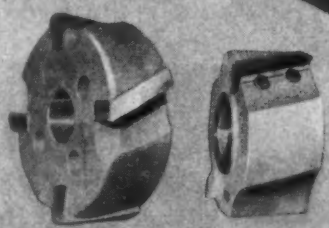
Ingersoll carbide tipped blades are copper brazed in atmosphere controlled furnaces to insure a strong uniform bond between tip and shank. Send your inquiries for replacement blades to Ingersoll. Note the many types illustrated above.

Send for Engineering Specification Sheets describing standard inserted blade cutters. Any of the designs may be furnished with carbide tipped, high speed steel, or cast alloy blades.

BORING BAR

TYPE NX

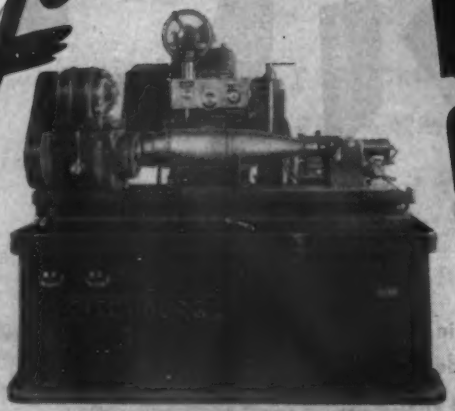
BORING BAR

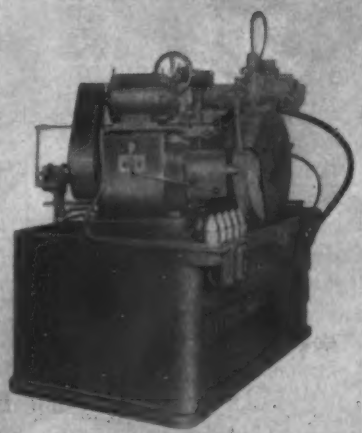


SPAR CAP MILLING

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

You can RECONVERT FITCHBURG GRINDERS





This book shows how to cut grinding costs . . . Sent free . . . write for it today.

With reconversion ahead Fitchburg users should keep in mind all Fitchburg Bowgage Head Precision Grinding Wheelhead Units are standard and interchangeable.

If the grinding operations for which they were purchased are discontinued, the heads can be remounted on standard machines, or on new special bases, for operations other than the ones originally specified. This is particularly appreciated by those using Fitchburg Grinders for ordnance production.

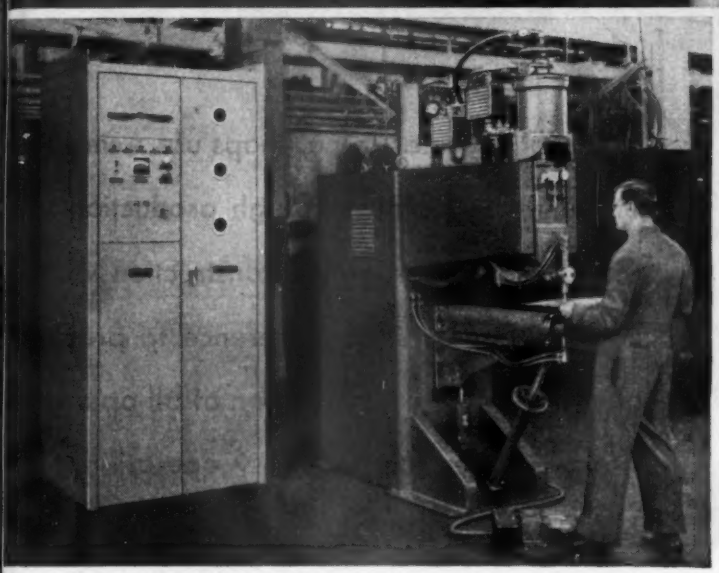
This exclusive Fitchburg feature protects your investment, and we suggest that future buyers of special purpose grinders or plain cylindrical grinders first consult Fitchburg engineers. Write us today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

Photo Courtesy Lockheed Aircraft Corp.



Use G-E CAPACITOR DISCHARGE CONTROL

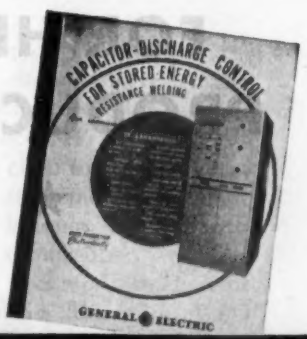
---It provides accurate forge-pressure timing for your stored-energy welding machines

CONSISTENT values of current and timing, so vital to uniform, high-quality, aluminum-alloy welds, are insured when your stored-energy welding machines are equipped with this G-E control. Experience proves that required welding energy is reduced and weld quality improved by the accurate forge-pressure timing provided by this control.

Because of its low demand kva, this control permits the use of welders on distribution systems which, without it, might be overloaded. Also, because of its low demand on the line, which means less voltage drop, you can economically install your welding machines in the most favorable places on your production line, even though the machine may be some distance from incoming distribution transformers.

Good voltage regulation, afforded by the low demand kva, also lessens the possibility of light flicker, and limits interference with other welding equipment on the same circuit.

The arrangement and accessibility of all parts of the control make it easy to install and service.



Want More Information?

General Electric Company, Sec. G-645-29
Schenectady 5, N. Y.

Please send a copy of your bulletin, "Capacitor-discharge control," No. GEA-3728, which describes the control, tells how it operates, and explains where it can be used most effectively.

Name .....

Company .....

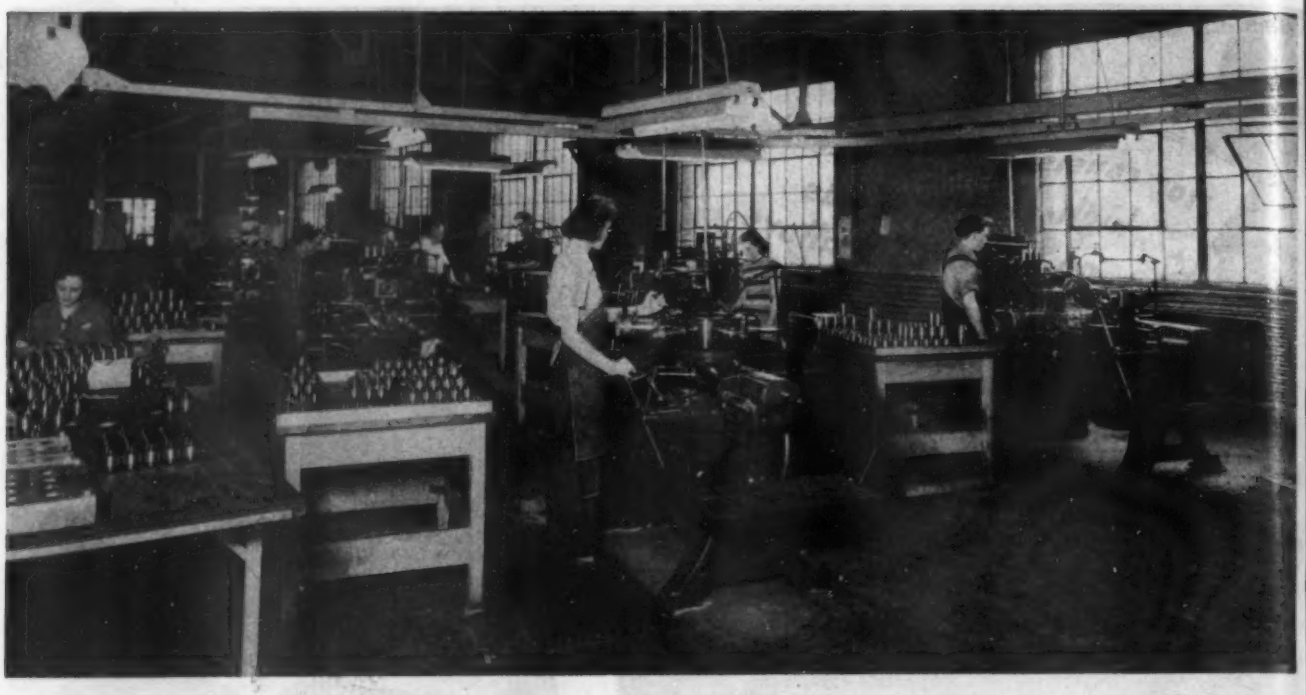
Address .....

.....

8960

BUY WAR BONDS

GENERAL ELECTRIC

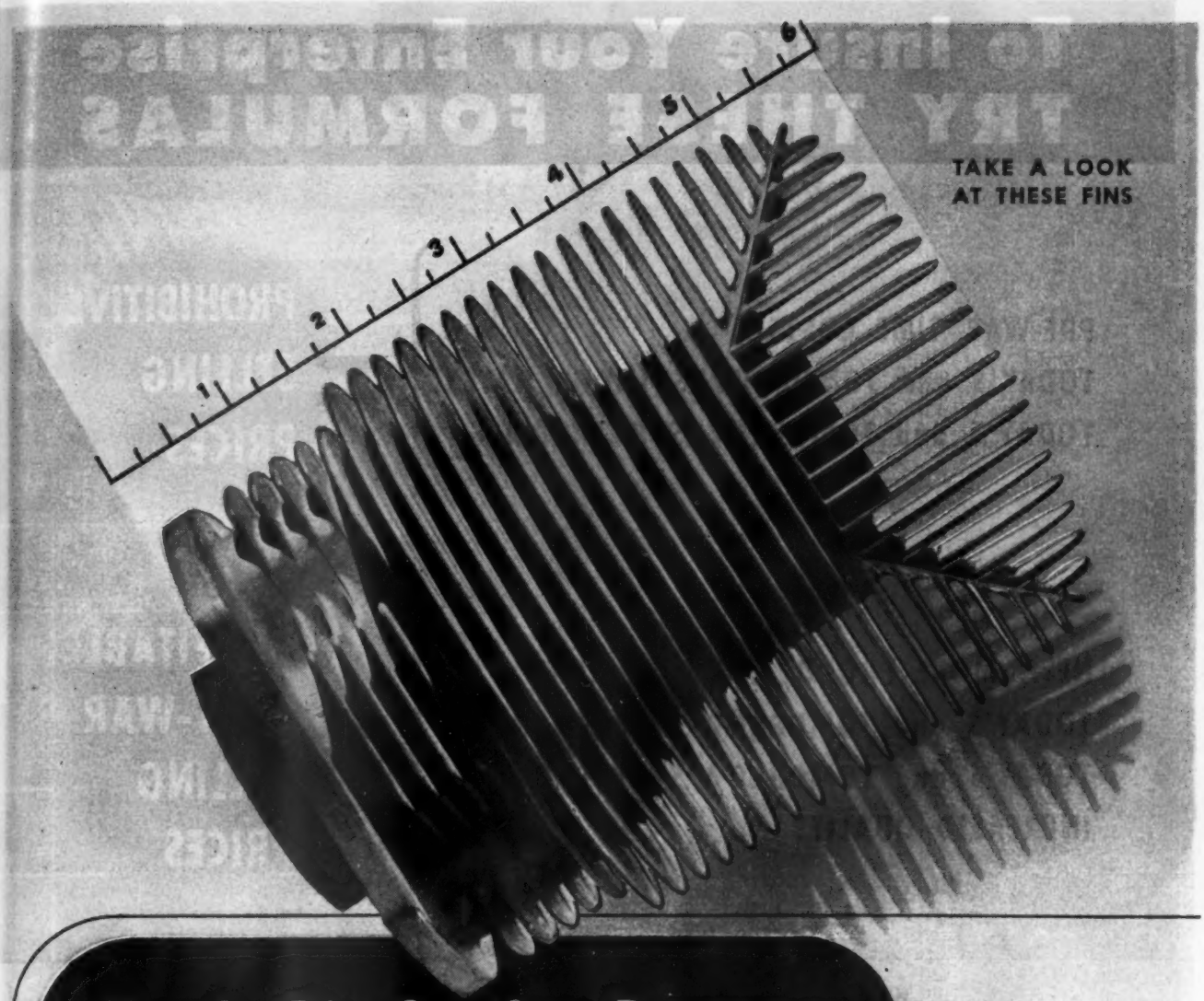


This battery of ACME TURRET LATHES MEET DEMAND FOR HIGH PRODUCTION

★

● For jobs such as these, shops use Acme Turret Lathes exclusively on high production war work. The sturdy, rigid, construction of the machine assures strict adherence to precision tolerances. The centralization of all operating controls makes for fast, easy operation. The simplicity of operation enables women operators to handle the machine with ease and produce precision work with very little training. The parts shown around the various machines are completely finished on this battery of Acme Turret Lathes. For power — precision — speed and flexibility, put your next job on an ACME.

The ACME MACHINE TOOL CO. ... CINCINNATI 32, OHIO.



Here's Die Casting Progress

Thinner, deeper and more closely spaced fins have been the trend in die castings like this, designed for rapid heat transfer. Alcoa's Garwood, New Jersey, Plant has pioneered in designing light-metal parts for production by this process, in making dies to produce these increasingly difficult designs, and improving casting techniques.

Manufacturers of engines and compressors have been able to obtain better, more efficient performance from equipment employing these Alcoa die castings. Since all of these products are materials of war, this progress has meant a boost for that effort.

Contributing, too, are these factors: Aluminum provides light weight with high strength, ability to withstand high temperatures, permanence of dimensions and shape, and resistance to corrosion. The die casting procedure speeds up production through accurate rendering of every design detail, with close tolerances, cast-in inserts, thin sections and smooth surfaces. Man-hours are saved, because a minimum amount of machining is required.

Doubtless, there are uses for which you haven't been able to obtain aluminum. Winning the war comes first. But aluminum is now being used for other-than-war purposes, as the manpower situation permits. Our representatives will be glad to discuss the availability of aluminum with you. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM

To Insure Your Enterprise TRY THESE FORMULAS

PRE-WAR TIME COSTS
TODAY'S and TOMORROW'S LABOR RATES
TODAY'S and TOMORROW'S OVERHEAD

= PROHIBITIVE SELLING PRICES

OR

NEW, MORE PRODUCTIVE TIME COST
TODAY'S and TOMORROW'S LABOR RATES
TODAY'S and TOMORROW'S OVERHEAD
INCREASED QUALITY

= PROFITABLE POST-WAR SELLING PRICES

RING GAGE ACCURACY AT PRODUCTION RATES BY
MICROHONING

Microhoning offers to industry a new tool with which to meet post-war demands for better products at moderate cost—at possibly increased labor rates. A process of final machining, **Microhoning now assumes added responsibility—it removes from .010 to .030 stock under automatic sizing control. By providing ring gage accuracy *at production speeds*, it offers a way of using the second formula to achieve profitable post-war prices.**

It will correct error in bores, or on cylindrical or spherical surfaces, either before or after heat treating—providing form and size accuracy to "tenths." In removing stock, it does not cause heat cracks. By removing distorted surface metal and cracks left by previous operations, it eliminates two of the most frequent causes of fatigue failure.

This modern abrading process also provides any desired surface finish. It is not limited in its application to iron and steel products, but is in successful operation on a wide variety of non-ferrous metals, such as silver-lined bearings and chromium-plated cylinder bores.

Micromatic Hone Corporation builds machines for Micro honing as required in industrial production. These rang from tool room type machines arranged to handle a wid variety of work to multiple spindle production machine which provide accuracy and high speed on production part

Microhoning can be very useful in you post-war production. Let our engineer discuss applications with you.

MICROMATIC H

MAKERS O

New MICROMATIC HYDROHONER MODEL 705

MULTIPLE SPINDLES

AUTOMATIC ROTARY INDEXING

MICROSIZE CONTROL

MICRODIAL FEED CONTROL

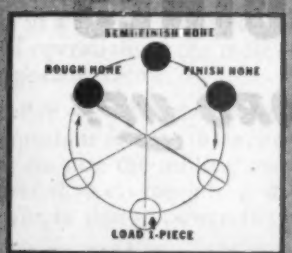
This new Micromatic Hydrohoner is a high speed production model, designed to produce large quantities of high precision parts. It may be used in multiple or progressive honing within uniform size limits (maximum) of .0003", on parts such as these:

Diesel Fuel Injectors, Pinion Gears, Precision Bearings, Bushings, Compressor Housing Bores, Piston Pin Holes, Connecting Rods, Valve Guides, Hydraulic Pump Bores, Rocker Arms, Ceramic Tubes, Valve Bodies.

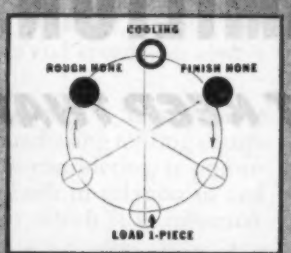
Variations in error which usually occur in production are corrected in straight run honing. Uniform size is automatically generated through the Micromatic Microsize Control—a positive, fully automatic method of generating uniform size.

Each spindle has its own individual Microsize Control, so that any desired combination in multiple or progressive honing may be set up.

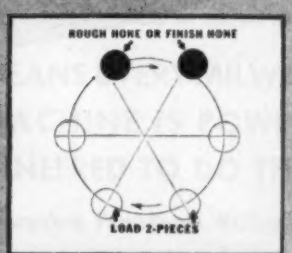
Three typical set ups are illustrated below:



THREE OPERATIONS. Progressive Honing Operations permit maximum stock removal per unit of time. Usually recommended for maximum stock removal ranging from .007 in ¼" diameter bores to .010 in 1" diameter bores.



TWO OPERATIONS. Progressive Honing Operations permit medium amount of stock removal per unit of time. Usually recommended for maximum stock removal ranging from .0035 in ¼" diameter bores to .005 in 1" diameter bores.



ONE OPERATION. Multiple Honing Operation permits conventional amount of stock removal per unit of time. Usually recommended for maximum stock removal ranging from .0005 to .0015 for hardened parts (55 Rock. C or harder), .001 to .003 for soft or medium hard parts, in bores from ¼" to 2" diameter.

HONE CORPORATION DETROIT 4, MICHIGAN

HONING MACHINE TOOLS

What makes 'em TICK...

HAMILTON ENGINES

BUT KEEP THAT GUARD UP!

Hamiltons power one-third of all the Liberty Ships.

The pendulum swings with them to victory.

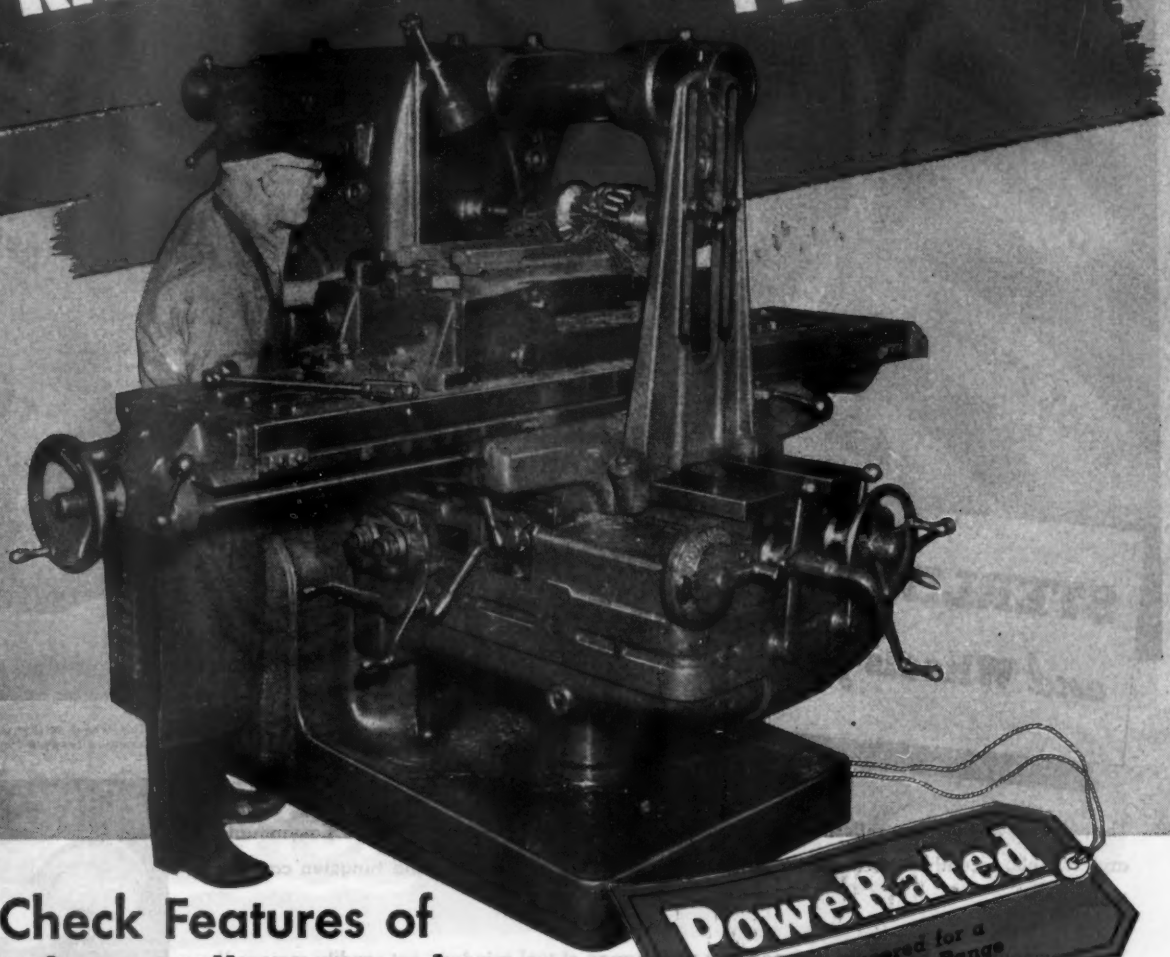
GENERAL MACHINERY CORPORATION

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO. • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDNANCE CORPORATION

✓✓RANGE ✓✓POWER ✓✓PRECISION



Double-Check Features of Milwaukee Milling Machines

Range in a milling machine — the capacity to handle a wide variation of operations at the most efficient feeds and speeds—is always an important factor.

But today — with advancements in cutting tools — motor hp. is the important feature to be checked when purchasing milling equipment. Be sure the milling machine you are considering is power-engineered to do the job — designed and built in relation to and with ample motor power for the work for which it is intended.

There is no need to resort to the unsound practice of substituting a higher hp. motor to gain power. The range of models of Milwaukee Milling Machines makes available a machine PoweRated and properly engineered for every class of job.

All Milwaukees are PoweRated — power-engineered in keeping with their rated motor hp. plus the normal overloads. They are precision-built and are capable of sustained precision-performance throughout a long productive life.

Remember — think of feed and speed range for light cuts — adequate motor power for heavy cuts — the need for sustained precision performance at all times. Check with a Kearney & Trecker field engineer in deciding which PoweRated Milwaukee is best suited to your specific needs.

MEANS EVERY MILWAUKEE MACHINE IS POWER ENGINEERED TO DO THE JOB

Milwaukee PoweRated Milling Machines

- **Standard Models — Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 HP.**
- **C.S.M. (Carbide Steel Milling) machines 20 to 50 HP.**
- **Special Machines—Consult K & T engineers.**

KEARNEY & TRECKER CORPORATION

MILWAUKEE 14 WISCONSIN

Milwaukee Machine Tools

STERLING'S *Easymounts* and Wheels *for* Grinding Tungsten Carbide Tools . . .

They are new, they are different, they are important! That describes Sterling's Easymounts and Wheels, recently introduced for better, faster grinding of all steels and tungsten carbide tools.

The Easymount can be rigidly fastened to a wide range of tool grinders, yet readily removed! It is made in sizes for any of these machines: Sellers, Heald, Excello, Baldor, Hammond, Delta, Prosser, Criterion, Blount, and Bura-Way. The Easymount is fitted with an easily tightened assembly that grips the wheel for efficient, safe grinding.

The new bond that has been used in the wheel imparts better cutting action and provides long wheel life. Available in all the necessary grain sizes, these wheels are ideal for roughing, semi-finishing, or finishing.

Give Sterling's Easymounts and Wheels a try! Realize the new economy that is possible through their use. Our engineers have many features to demonstrate . . write us for literature!

The wheel easily slips into the Easymount, already mounted on the grinder.

Each screw furnishes proper tension as it is tightened, yet does not touch the abrasive at any point!

After only a minute or two spent in assembly, the Easymount and Wheel are ready for long, efficient grinding.

• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

RESEARCH - Basic Reason for Better Carbides

Years of unrelenting research by Philip M. McKenna resulted, in 1937, in the discovery of the hardest man-made material—a unique intermetallic compound, tungsten-titanium-carbide, corresponding to the chemical formula $WTiC_2$. This compound is the basic ingredient of steel-cutting compositions of Kennametal. It distinguishes them from all other cemented carbides.

Introduced in 1938, Kennametal quickly became established as the tool material that made possible machining of hard steel, accurately, at greatly increased speeds. Kennametal's spectacular performance in this field was a tremendous stimulus to increased research activities, which since 1938, have led to the successful development of:

- *a series of Kennametal compositions, of varying degrees of hardness, strength, and toughness, exactly suited for machining various types of steel, as well as tough, stringy non-ferrous alloys.*
- *a new, highly abrasion-resistant tungsten carbide Kennametal composition that cuts cast iron at greatly accelerated rates, with amazing tool life.*
- *a complete line of machining tools, designed to make fullest utilization of possibilities inherent in Kennametal compositions.*
- *Kennametal lathe files, that outlast steel files up to 200 times, and produce a superior finish.*
- *a wide variety of wear-resistant products, including lathe and grinder centers, pump valve balls and seats, gage tips, etc.*
- *negative-rake carbide milling cutters, notable among which is the widely used inserted-blade Kennamill step-cutter.*

Research—looking to still further improvement in the properties and applicability of Kennametal—will continue, and expand, so long as the useful products of inventive genius are protected under an uninhibited American system of free enterprise.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc. LATROBE, PA.

this eight-ounce detective catches each separate vibration

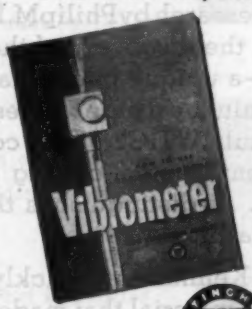
USUALLY, every internal vibration has a different frequency—which is its identifying trade-mark. Nab this vibration at its source and the rest is easy—the cure will suggest itself.

The new Westinghouse Vibrometer is the quickest, simplest, most economical (only $92!) instrument you can get for the job. Just hold it against the vibrating machine and turn the knob through its range to vary the length of the reed. This reed will vibrate in unison with *each separate* vibration in the machine—and you can read the frequency *directly* from the scale on the other end.

Follow this procedure for each machine, tracing the flow of power from the prime mover, and you'll be able to identify each vibration *positively*—at its source. The Vibrometer automatically breaks complex vibrations down to their component individual vibrations — no more interpolation of vibration wave forms is necessary.

All vibration frequencies between 500 and 20,000 cycles a minute register directly on the Vibrometer scale—and harmonics of a vibration will not register unless they're actually present in the machine.

Call your nearest Westinghouse dealer for a demonstration. You'll see the most versatile vibration analysis instrument available today—small enough and light enough for use *anywhere*, yet sensitive and accurate enough for every normal need. Westinghouse Electric & Mfg. Co., P. O. Box 868, Pittsburgh 30, Pa. J-08093



What the Vibrometer does—how it operates, is described in detail in this new 32-page pocket-size manual, B-3414. Write for your free copy today.

Westinghouse

Vibration Analysis

Instruments

Use HARDINGE Collets and get all 3*

* 1. Accuracy
2. Spring Temper
3. Long Life

You are assured of the three essential requisites for proper collet performance when you use **HARDINGE** Collets.

When ordering collets only, or when ordering collets with lathes or milling machines of any make or size — specify **HARDINGE** Collets . . . they cost no more than other Collets.

If you do not have the **HARDINGE** Bulletin No. 41 giving full details, write for your copy today.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling of tool and production work

THE fastest producing and most accurate machine in the field.

Many users are reporting consistent experience of two to three times the output and higher quality work.

Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch).

Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work.

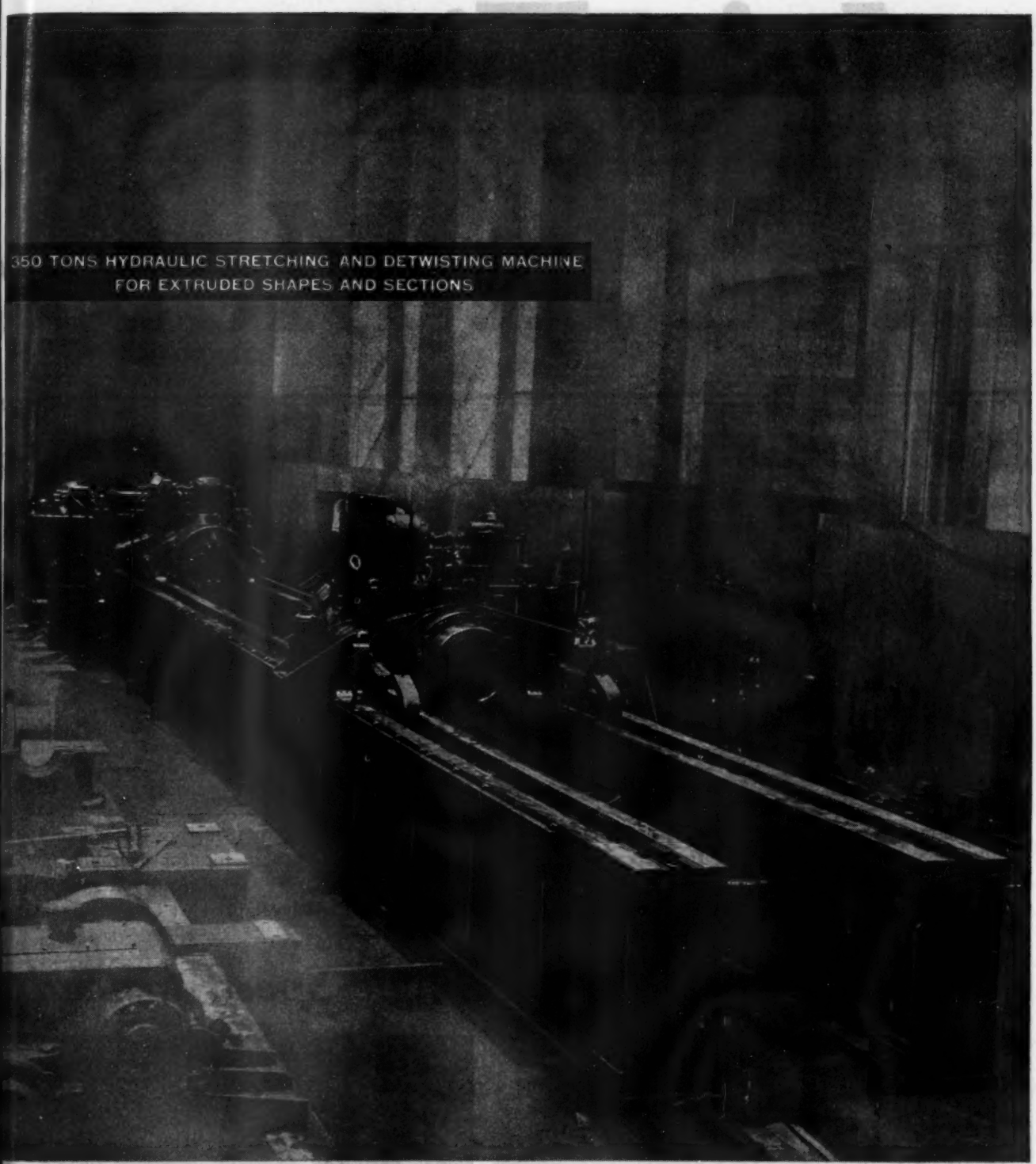
Unique operation and controls that make possible high precision work with relatively little skill.

★ ★ ★

JIGMIL—The world's finest BORING and milling machine is made in Detroit.

★ No. 1—Illustration showing convenience of jig plate boring. No. 2—Eight holes precision bored. Holes spaced within .0001 with total dependence of all spacing on automatic positioning means.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20 (Detroit) MICH.**



350 TONS HYDRAULIC STRETCHING AND DETWISTING MACHINE
FOR EXTRUDED SHAPES AND SECTIONS

HYDROPRESS · INC.

ENGINEERS *CONTRACTORS*

HYDRAULIC PRESSES · ROLLING MILLS
STRETCHERS · PUMPS · ACCUMULATORS

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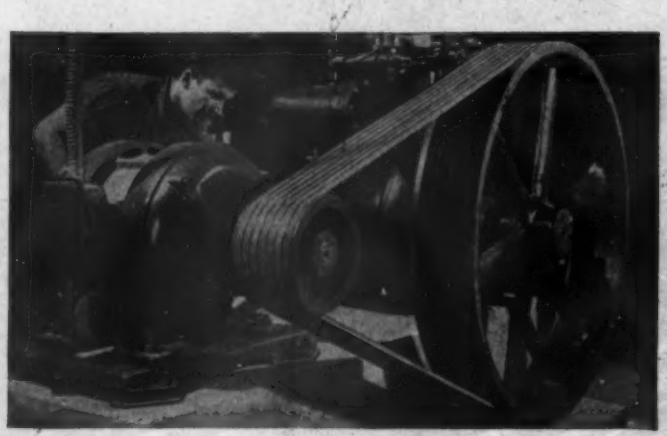
It's Time to
Look at Motor

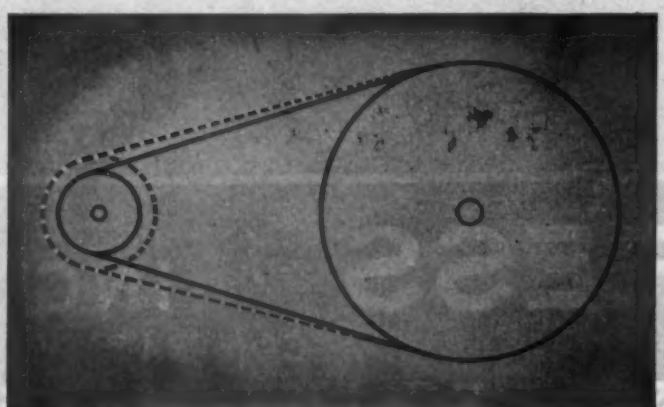
➔You Can Save with High-Speed Instead o



1. In most applications, an 1800 rpm motor with Texrope Drive will ably do the job of a lower-speed, direct-connected motor . . . *and* give you *exactly* the speed you want — *at lower cost!*

2. When you buy an 1800 rpm instead of 450 rp 15 hp squirrel-cage motor, for example, 600 lb critical materials are saved. And *you* save well ov $200—with the drive figured in! This saving is typic

➔You Can Save with Single-Speed Instead o



1. Infrequently needed speed changes can be had by changing from one size motor sheave to another. By juggling *complete* drives, speeds can be changed over the full range — from 1:1 to 7:1.

2. With the Allis-Chalmers Vari-Pitch Sheave, y can increase or decrease speed by adjusting shea diameter, as above. Within limits, an unbrok series of speeds can be obtained.

Take a Fresh Buying!

WAR FORCES HIGHER EFFICIENCIES...

It was good business in peacetime to use — as widely as possible — high-speed motors with Allis-Chalmers Texrope Drives...and single-speed motors with Allis-Chalmers Vari-Pitch Sheaves and Speed-Changers. And it's clearer every day that those material and money-saving practices are *vital* practices in time of war!

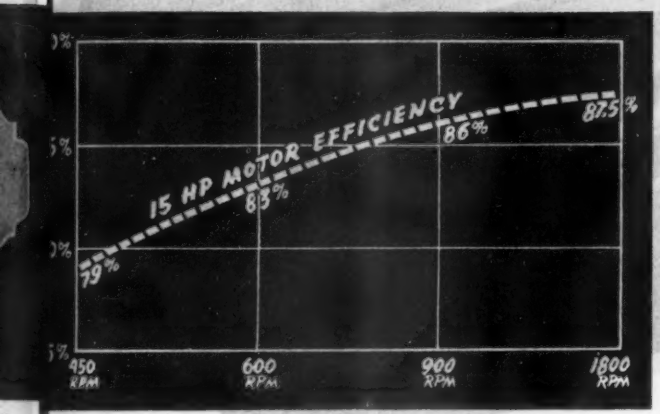
TODAY the whole picture of buying and applying motors has changed. Note at the left how much you can save for your country *and yourself* with high and single-speed motors made flexible by Texrope Drives.

As America's only builder of both electric motors and V-belt drives, Allis-Chalmers has long advocated the proper combining of motor and V-belt drive.

And today you benefit from Allis-Chalmers' vast, pioneering experience in this field when you ask for and get the *right* combination of Lo-Maintenance Motor and Texrope Drive! Call your nearby district office. Or write ALLIS-CHALMERS MFG. CO. MILWAUKEE, WISCONSIN.

A 1560

Low-Speed Motors...



Note that efficiency rises from 79% for a 450 rpm motor to 87.5% for an 1800 rpm motor. Comparing power consumption, the 1800 rpm motor saves you over 30 kwh/24 hr. day.

Multi-Speed Motors...

Allis-Chalmers Vari-Pitch Speed Changer gives you infinite changes at the turn of a wheel — within 3.75 to 1. It's the most compact, flexible variable-speed transmission available.

♪ *Tune in the Boston Symphony, Blue Network, Saturday at 8:30 pm, EWT.*

ALLIS-CHALMERS A-C MILWAUKEE

WE WORK FOR VICTORY

WE PLAN FOR PEACE

ARMSTRONG ARMIDE *Carbide* TOOL SETS

CARBIDE-TIPPED TOOLS FOR EVERY-DAY OPERATIONS

ARMIDE TOOL SETS simplify many everyday jobs in tool rooms, shops and maintenance departments. They are standard, multi-purpose tools which offer special advantages on machining operations involving: (1) Long runs, (2) High speed operation, (3) Cast iron, (4) Tough alloy steels, (5) Non-metallics, (6) Hardened parts (obviate need for annealing and re-hardening).

Each set comprises: 3 ARMSTRONG *Carbide* TOOL HOLDERS, 8 ARMIDE Carbide-Tipped Cutters—4 ARMIDE Red, for machining steel and 4 ARMIDE Gray, for machining Cast iron, brass, bronze, aluminum and non-metallics; with service wrench in a fitted steel case. (as illustrated)

ARMSTRONG-ARMIDE Sets are stocked by leading Industrial Distributors in 4 sizes.

Write for Bulletin-C844.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Ave., CHICAGO 12, U.S.A.

Eastern Warehouse & Sales:

199 Lafayette St., New York

SHE PUTS THE PRESSURE ON PRODUCTION

. . . with her finger tips

YES, we've come to this in turret lathe operation!

There's no need for muscle and brawn. It's easy to maintain a swift cycle of machining operations with the new hydraulic clutching and braking, now standard on all Gisholt Ram Type Turret Lathes. Physical effort is almost eliminated. A mere flick of the trip lever to right or left, is all it takes to start, stop or reverse the spindle. Braking, which is automatic in neutral position, brings the work quickly and smoothly to rest.

By translating finger touch to hydraulic power, Gisholt's hydraulic clutching and braking not only eliminates the fatigue factor but speeds the machining cycle—puts pressure on production. It is only one of the many Gisholt improvements that will reduce your machining time and cost, now and in the years ahead.

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements in Metal Turning

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

HIGH ★ ★ ★ *on the list*

● The superior quality of Mid-West Super-Cut grinding wheels and honing stones, backed by tests conducted under the most rigorous conditions, has placed them ace-high on the purchasing department's "appoved list."

Mid-West's staff of field experts is always available to solve your abrasive problems. And with the speed of delivery assured for every item in our line, the Mid-West Abrasive Company tops the source rating of many a wise buyer.

Let our engineers make a survey of YOUR plant and determine its abrasive needs. You'll find that your buyer, too, will look to Mid-West as a "preferred source" for dependable, wide-ranged abrasive products.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. 1960 E. Milwaukee, Detroit 11, Mich. Rochester, Pa.

just a Stumble bum

You've seen them in the ring floundering around under a rain of gloved fists. You've seen them cadging nickels and dimes on the streets . . . the men who paid no heed to the ravages of time and remained in a profession whose great requisite is youth. The years caught up with them. And with the years came the cauliflower ears, the scar tissue around the eyes, the crooked nose. Once they were good. Now they are "Has Beens"—"Stumble Bums" unfit for the gruelling competition of their calling.

But what about those "Stumble Bums" in your plant, Mr. Manufacturer? Those old lathes of yours that have seen better days. Once they were good too, probably the best. But the years have caught up with them and now they too are just "Stumble Bums"—and very definitely unfit for real competitive production.

Investigate the merits of the New LeBlond Lathes. They'll help you meet tomorrow's greater, keener competition with confidence.

LeBlond is building tomorrow's lathes today. Write for catalog.

LEBLOND No. 6 GUN BORING LATHE

AT YOUR SERVICE

We have been building lathes since 1887. Today LeBlond Lathes are used on turning operations the world over. The accumulated knowledge of every manufacturing trend in good times and bad . . . peace and war, gained from thousands of installations is now available to you.

Our field engineers are at your service . . . ready to help you in your development work for the postwar era—particularly along the lines of the difficult, out-of-the ordinary turning problems. This service is yours for the asking. Contact our nearest dealer or write—Department FE-46.

★ YOUR BONDS BUY BOMBS ★
BUY A "BLOCK-BUSTER" TODAY!

THE R. K. **Le BLOND** MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 13, 103 Lafayette St., CAnal 6-5281
CHICAGO 6, 20 N. Wacker Dr., STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

FORTY FEET OF *Precision*

• A 18"x 24"x 240" HILL "Open Side" Vertical Spindle Hydraulic Surface Grinder—with single piece semi-steel bed casting 43½ feet long—one of the largest precision grinders ever built.

This HILL Vertical Spindle Surface Grinder . . . recently delivered to one of the country's leading producers of precision tools . . . is ideally adapted for rapid stock removal to close tolerances.

HILL Hydraulic Grinders feature:

Massive Construction	Centralized Controls
100% Hydraulic Table Drive	"Open Side" Convenience
Built-in Spindle Motor	Permanent Accuracy

Built in table widths of 18", 24" and 30", with table lengths of 5 to 20 feet.

ALSO BUILT IN HORIZONTAL SPINDLE DESIGN

The HILL ACME Co.

6400 BREAKWATER AVE • CLEVELAND, OHIO

The gage of today is NORBIDE*

The gage of today is NORBIDE (Norton Boron Carbide) because this hardest of man-made materials outwears conventional types of measuring devices 100 times and more. NORBIDE gages show exceptional resistance to abrasion and scratching; they will not pick up lint or become charged with particles of metal; they are inert to chemicals ordinarily employed where gages are used. NORBIDE blanks for plug, ring, snap and keyway gages and NORBIDE contact points for dial indicator gages can be obtained from your regular gage supplier.

For further information on NORBIDE gages write for booklet #1100 to:

NORTON COMPANY — WORCESTER 6, MASS.

*Hardest Material Made by Man

because they can be depended on for

ECONOMY, EFFICIENCY *and* SPEED

All the essential performance qualities demanded in small tools today are met in UNION TOOLS.

Faster cutting, longer life between grinds, accuracy and all-round better performance of these tools are matters of common recognition in plants busy on war work where small tools are subjected to the most exacting service conditions.

You, too, can depend on UNION TOOLS for your requirements. Try them once and you'll use them regularly.

THE UNION LINE

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

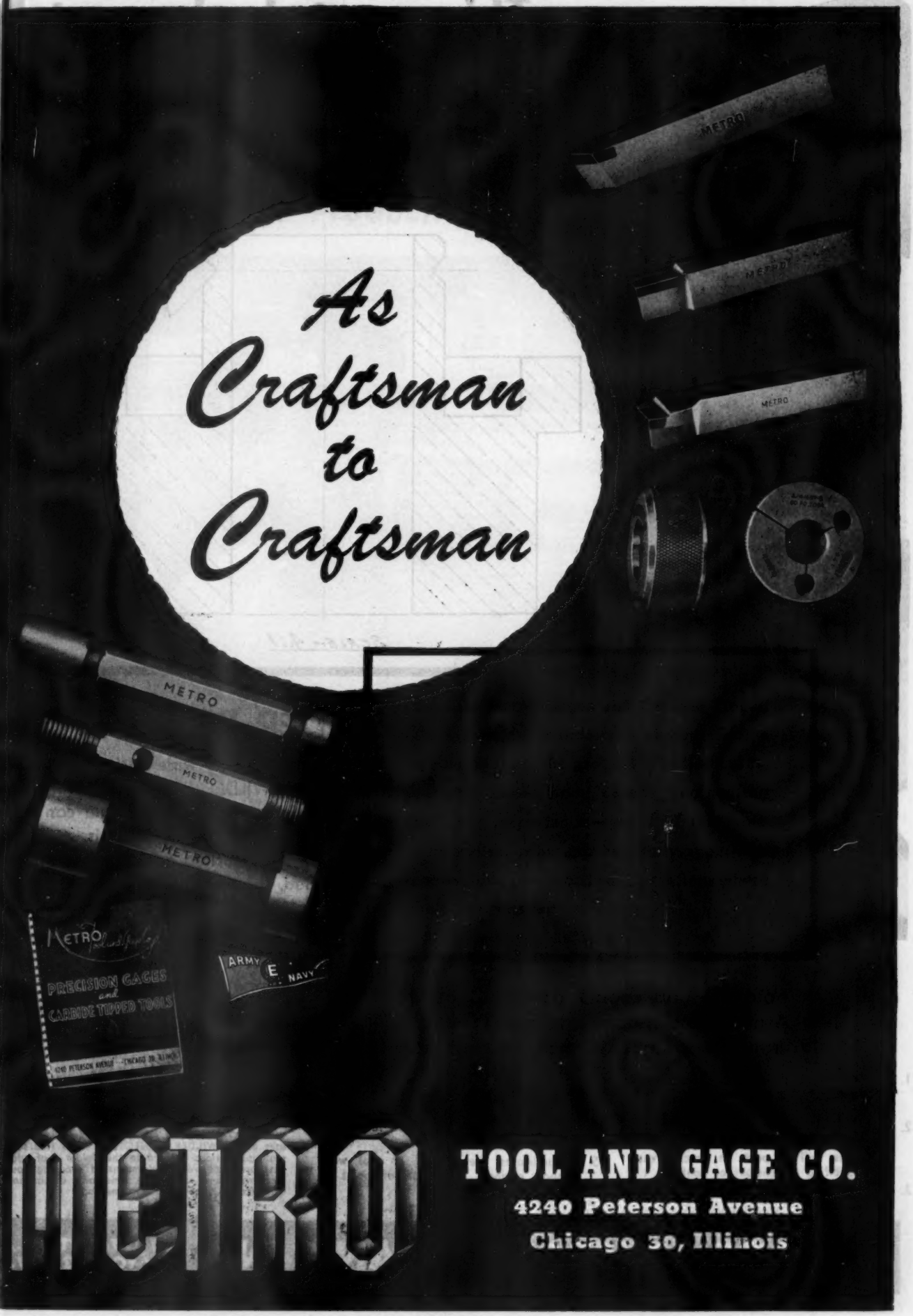
UNION TWIST DRILL COMPANY, ATHOL, MASS.

STORES—New York: 61 Reade St., Chicago: 11 So. Clinton St., Detroit: 5527 Woodward Ave., San Francisco: 121 Second St., Los Angeles: 524 E. Fourth St., Seattle: 568 First Ave., South.

MANUFACTURING DIVISIONS

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

UNION

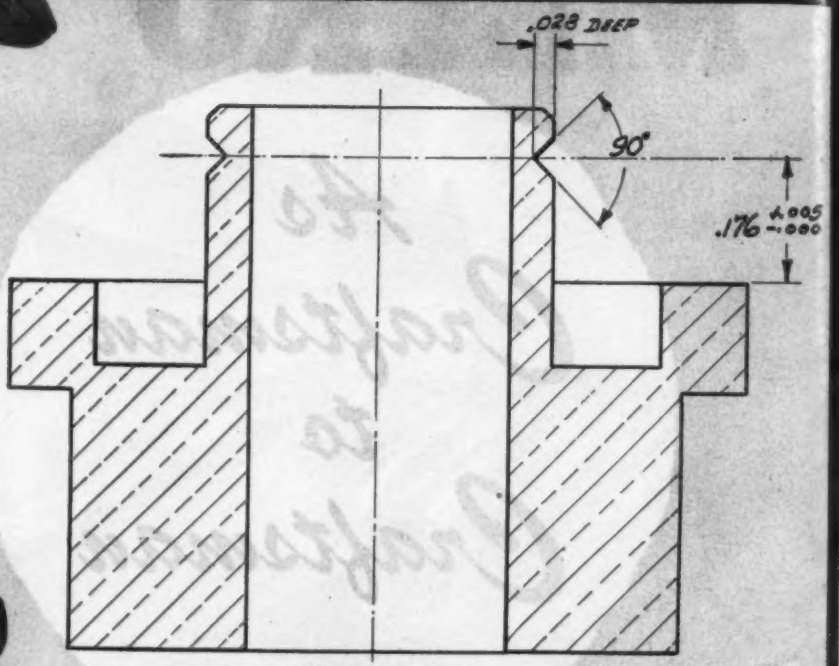


METRO TOOL AND GAGE CO.

4240 Peterson Avenue

Chicago 30, Illinois

This part is inspected in SECONDS . . .



Checking a circular form tool on the WILDER PROJECTOR.

on the WILDER PROJECTOR

The part shown here is typical of the wide variety of work that can be checked on the WILDER PROJECTOR. In this specific case, three dimensions including an angle can be inspected in one operation. The work piece is quickly located on a simple fixture and checked against a drawing. Errors, 12½ times magnified, show up on the screen in front of the operator.

The WILDER PROJECTOR has many applications in every machine shop and plant and is a great time-saver as an optical precision checker on work of all kinds.

Ask to be placed on mailing list to receive "PRECISE PRODUCTION", a Scherr publication sent regularly to all those interested in modern inspection methods. Sent FREE and without obligation.

Advantages and Typical Applications in Inspection

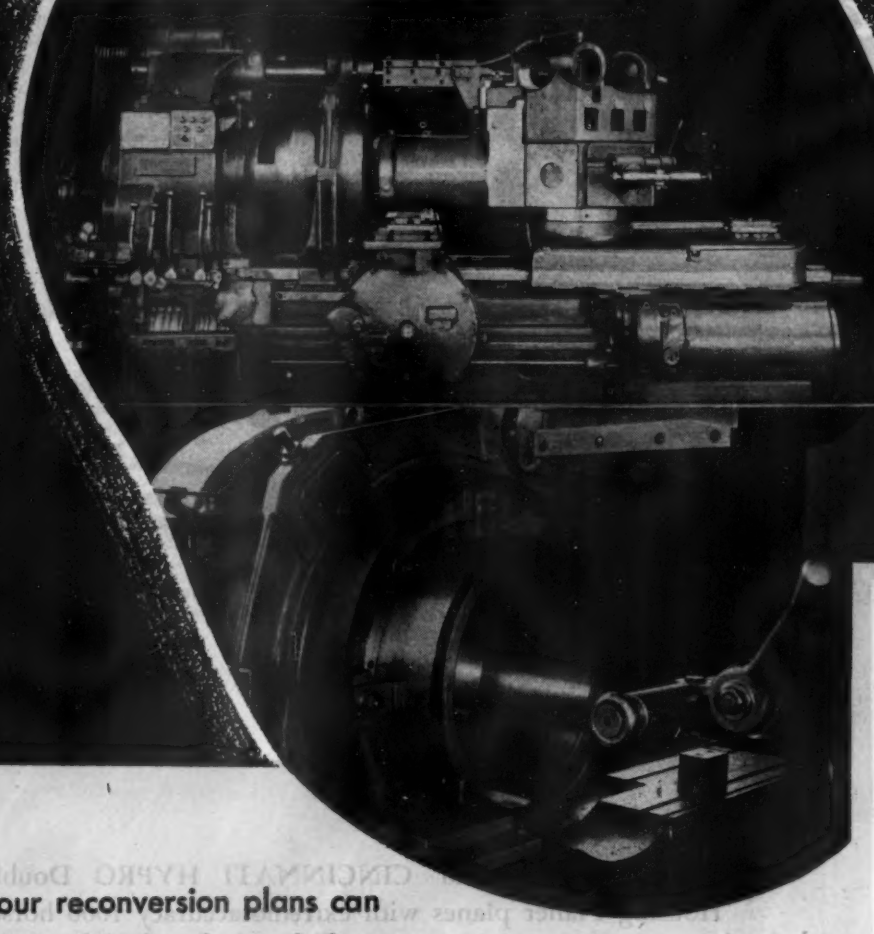
1. It makes possible faster and more positive inspection by eliminating the uncertain human element of "feel."
2. It enables you to see exactly on a greatly enlarged image where tools, templates, gages, as well as parts in process vary from specified dimensions or contours.
3. And when you see exactly where and how much the errors are, it is easy to correct them, before they get into production.
4. It enables you to verify machine settings by quickly checking the first few parts, thus avoiding rejects.
5. It facilitates the control of tool wear through periodic inspection of parts in process
6. It is ideally suited for 100% inspection of the finished parts, where perfect interchangeability in assembly is required.

WRITE AT ONCE for NEW folder describing the uses of the WILDER PROJECTOR. You'll find several applications covered in this folder that suggest practical ways and means of reducing your measuring and inspecting time and eliminating complicated time-consuming methods.

GEORGE SCHERR COMPANY, INC. 200 LAFAYETTE ST., NEW YORK 12, N. Y.

P&J RE-TOOLING

will convert your machines for Civilian Production



P & J
Rebuilding Service

Investigate this service by which existing P & J machines are restored in our shops to original productivity and accuracy. Rebuilding time is a good time, too, for re-tooling.

Your reconversion plans can be simplified and speeded up by knowing in advance exactly how your present P & J machines may be re-tooled for civilian products.

The big 9 DT P & J Automatic Chucking and Turning Machine set-up for war work as shown here, for example, need not remain idle when the plant returns again to peace time production. On the contrary, there are many kinds of heavy work which this powerful P & J machine can handle profitably and thereby assure still further returns on the original investment.

Re-tooling will greatly extend the useful life of this and other P & J machines with the cost of changeover fully justified by the savings it will make in time and labor.

Why not consult P & J engineers on your reconversion plans and let them help you get maximum production at lowest cost from your present machines re-tooled for the jobs ahead.

The POTTER & JOHNSTON MACHINE CO.
Pawtucket, R. I.

The Bonds you buy have the best security in the world . . . Uncle Sam!

CINCINNATI HYPRO

Planes Diesel Engine Blocks for Submarines and Locomotives

This 78" x 72" x 28' CINCINNATI HYPRO Double Housing Planer planes with extreme accuracy 1000 horsepower Fairbanks-Morse Diesel Engine blocks . . . roughs and finishes main bearing seats, the top and bottom of the cylinder block and the main bearing cap fits.

Massive construction enables this CINCINNATI HYPRO Planer to machine two engine blocks weighing many tons without affecting the planer's rigidity or accuracy. The box type table is amply ribbed to withstand strains of heaviest clamping without distortion.

ARMY E NAVY

Write for Bulletin 136-AM containing full information illustrating advantages of Cincinnati Hypro Planers.

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

Simplify Magnetic Chucking
with
PERMANENT MAGNET TYPE CHUCKS

NO WIRES—NO HEATING
NO OPERATING COSTS

Permanent magnet type chucks are ready for instant use on any machine of suitable size as well as on work bench or surface plate. No electrical connections of any kind are needed. Send for complete catalog. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

For sale only in the United States of America and its Territories and in Canada.

RECTANGULAR MODELS
*2½ x 5
5 x 10
6 x 18
8 x 24
12 x 36
*Differs from illustration

ROTARY MODEL
9" Diam.

. . . We urge buying through the Distributor

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BROWN & SHARPE

ALL STANDARD SIZES

National Fine—National Coarse

0-80 to 1½-6

Also Pipe Plug Gages ⅛ to 1¼

CADILLAC
Thread
GAGES

WHEN you need standard Thread Plug or Thread Ring Gages in a hurry, you'll save time by ordering them from Cadillac. As a rule, all orders received by 4:00 p.m. are shipped the same day.

As manufacturers of thread gages exclusively, serving many companies which use gages in exceptionally large quantities, we carry an unusually complete stock of thread gages in all standard sizes.

If you are having difficulty in securing quick deliveries of gages, wire Cadillac! The chances are we have in stock the exact sizes you need, ready and waiting to be packed and shipped.

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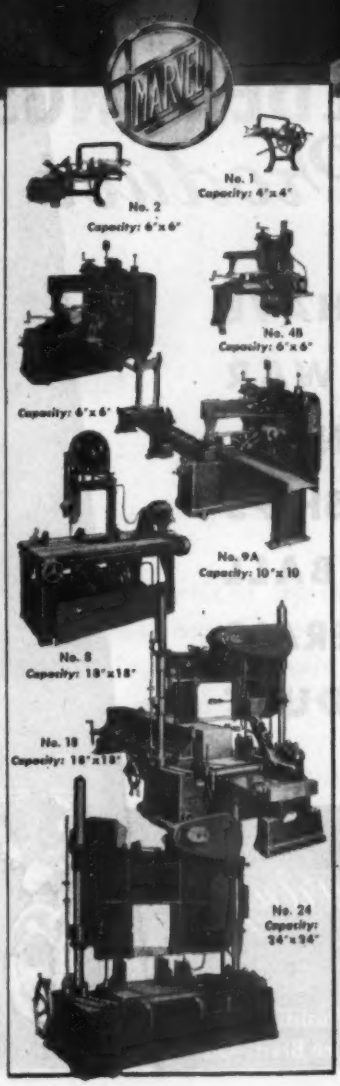
CADILLAC GAGE COMPANY

20316 Hoover Road Detroit 5, Mich.



The MARVEL No. 8 does this job with ease— fast and economically

The Denver Shops of the Denver Rio Grande and Western Railroad, like numerous other railroad shops, have found the No. 8 MARVEL Universal Metal Cutting Band Saw Machine the ideal metal sawing machine. The illustration shows the cutting of floating rod bushings into three equal sections. Normally a difficult and expensive operation, this job is done on a No. 8 MARVEL Band Saw with ease, speedily and economically. No special tools, jigs, or high mechanical skill are required.

In railroad shops, as in many machine shops, tool rooms, and fabricating shops, there is a real need for a UNIVERSAL metal sawing machine that will cut the smallest, most delicate pieces as well as solid blocks 18" x 18". The No. 8 MARVEL Band Saw Machine answers these requirements and in addition will mitre, trim, notch and make re-entrant cuts.

The No. 8 MARVEL Metal Band Sawing Machine is but one machine in the MARVEL system. There is a MARVEL Metal Cutting Saw (either hack saw or band saw) for every shop's need. A local service engineer is available to survey your work without cost or obligation. He will recommend the best saw for your work, supplying accurate cost and production data. Write us asking for a call by a MARVEL sawing expert. A complete catalog is also available.

ARMSTRONG-BLUM MFG. CO.

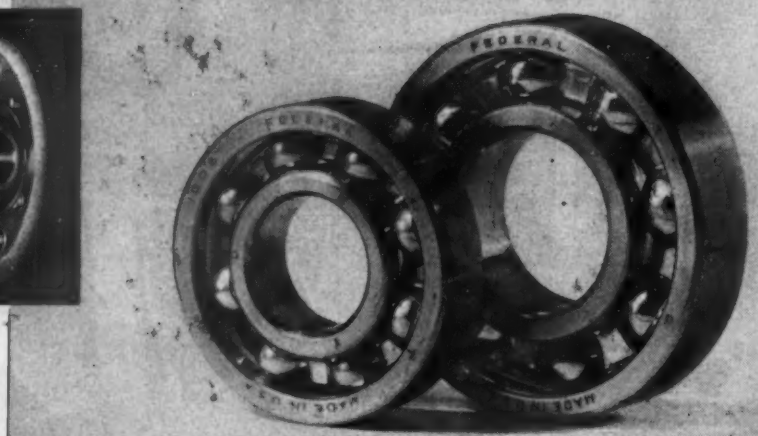
"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

FEDERAL



Include these FINE BALL BEARINGS in your POST-WAR Product

FEDERAL BALL BEARINGS HAVE ACHIEVED AN ENVIABLE WAR RECORD IN U. S. PLANES, MECHANIZED VEHICLES AND SHIPS. • IF YOU SEEK THE SAME BALL BEARING EFFICIENCY USE FEDERALS IN YOUR POST-WAR PRODUCT

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

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QUICK, ECONOMICAL FINISHING FOR YOUR FLAT SURFACE PARTS

FLEXIBLE, GENERAL-PURPOSE EQUIPMENT RETAINING ALL THE ADVANTAGES OF A SINGLE-PURPOSE MACHINE

NEWTON 76" VERTICAL SPINDLE CONTINUOUS MILLING MACHINE

Newton Vertical Spindle Continuous Milling Machines are built in types and sizes suitable to a wide milling range in fast, accurate production of flat surface parts. They are equipped with one or more spindles depending upon the type of work to be performed.

Single spindle machines are adapted to either rough or finish milling. Those fitted with more than one spindle do rough and finish milling at one work-setting. Of simple design, these machines are easy to operate and control, and require but little floor space.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

This Special Adaptation of **BAKER** *Model 36-HO Speeds Production of Radial Engines*

...saves valuable time in "getting them in the air"

A 39 spindle special fixed center multiple head . . . a special slide table . . . and a power-operated bushing—that is all it took to fit this standard BAKER Model 36-HO to the exacting requirements of this job.

The machine as shown was furnished for multiple drilling operations in large magnesium castings used in radial engines. Due to the size of the casting, the machine was equipped with a special slide table which makes possible quick, easy loading and unloading at the front of the machine, clear of the operating position. The table is air-actuated, controlled by a valve placed convenient to operator's position.

The tool support bushing plates supporting all 39 drills is carried in a plate that is adjustable up and down on fixture at the rear cutting position. This power movement was designed and furnished by BAKER and has proved valuable in eliminating operator-fatigue. Other important features of this machine include a special attachment furnished to permit step drilling, plus the fact that all important attachments and controls are out in the open, easily accessible for servicing and adjusting.

Here again, a BAKER Machine more than meets all requirements . . . and proves further the adaptability of BAKER units to special drilling, boring and tapping needs. This adaptability will carry over into peacetime production, too—so contact BAKER now on current problems and problems of conversion!

BAKER BROTHERS, INC. • Toledo, Ohio, U.S.A.

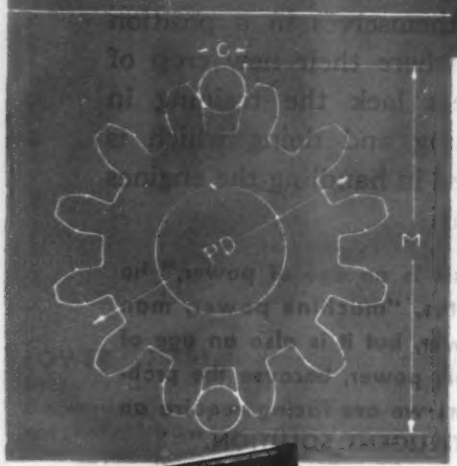
DRILLING • BORING • TAPPING

Our Motto Since 1867: "Machines Sturdy and Efficient, as Fine as Can Be Built..."

Van Keuren simplified GEAR MEASURING SYSTEM

Set No. 26 Ex. Gear Measuring Wires

...provides GREATER ACCURACY... and SIMPLIFIED CALCULATIONS

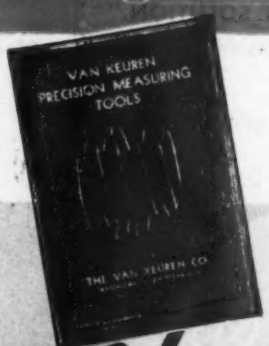


Simple! . . . The only calculation required is one of simple division.

Reliable! . . . The system is based on formulas approved by the American Gear Manufacturers Association.

Accurate! . . . Van Keuren Gear Measuring Wires are accurate to within 25 millionths of an inch for roundness and exact size.

Van Keuren gear measuring tables give the measurements (M) over the wires (G) for 1 diametral pitch gears of correct pitch diameter (PD). The only calculation required is to divide the measurement for 1 diametral pitch by the diametral pitch of the gear being measured. The tables are complete for gears from 5 to 171 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. The tables provide for measuring external, internal and helical gears. They are far more accurate than anything previously available and no interpolations are required.



ULTIMATE ACCURACY

Our Catalog No. 33 is a manual of precision measuring systems, giving complete tables and simplified formulas for measuring all standard threads, splines, gears, and worms. Send for this valuable handbook.

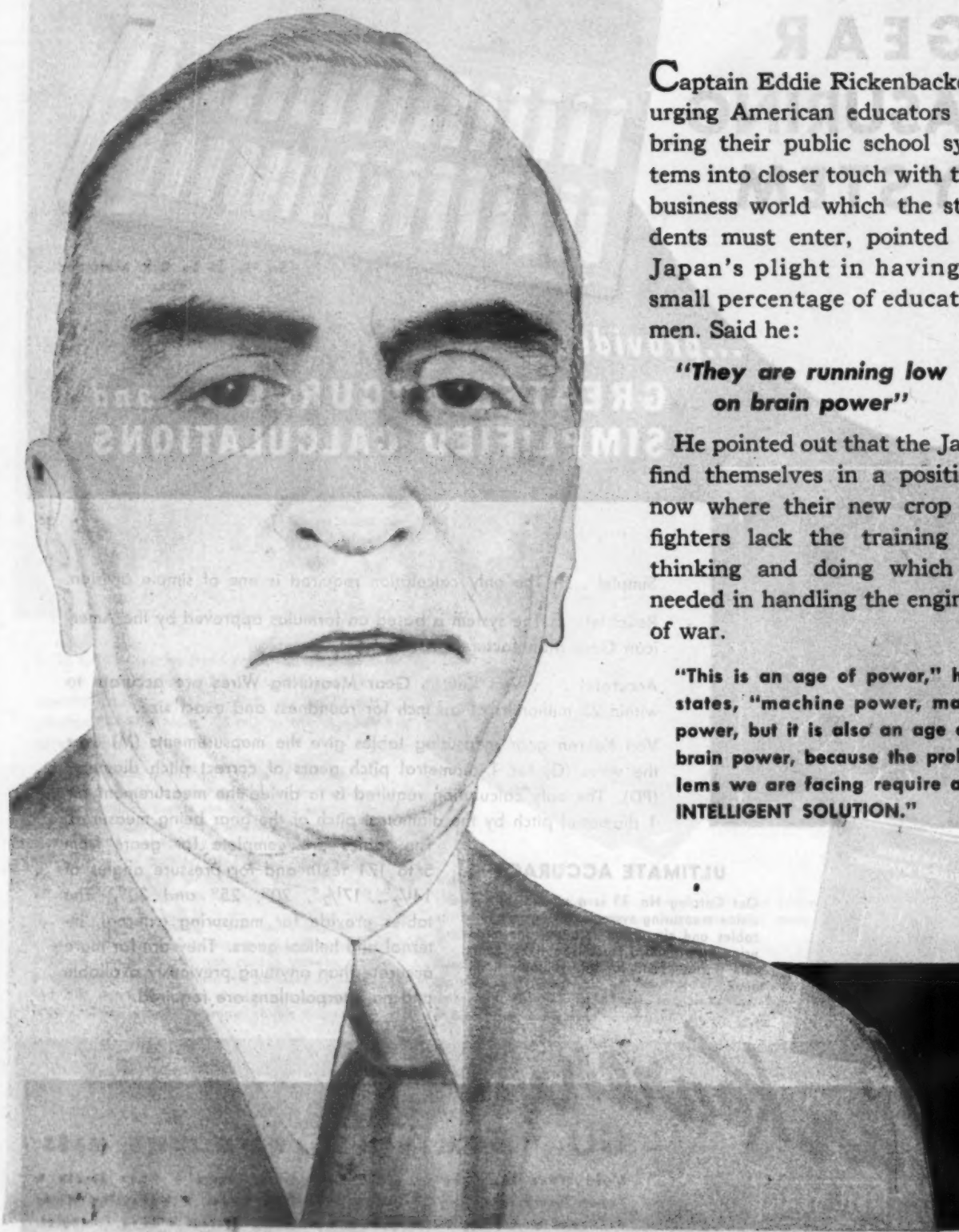
THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

25th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

then he said to himself

"They're Short on Brains"



Captain Eddie Rickenbacker, urging American educators to bring their public school systems into closer touch with the business world which the students must enter, pointed to Japan's plight in having a small percentage of educated men. Said he:

"They are running low on brain power"

He pointed out that the Japs find themselves in a position now where their new crop of fighters lack the training in thinking and doing which is needed in handling the engines of war.

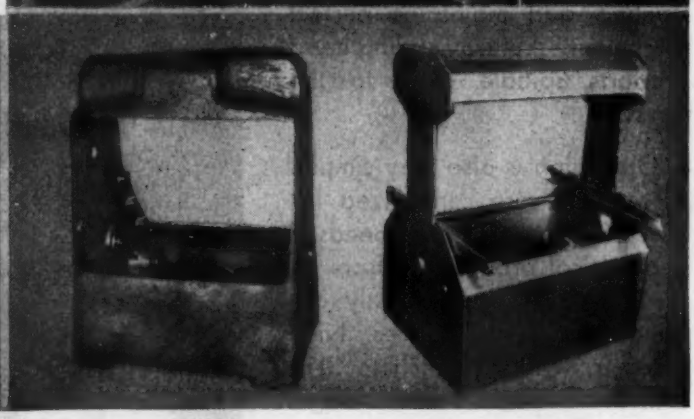
"This is an age of power," he states, "machine power, man power, but it is also an age of brain power, because the problems we are facing require an INTELLIGENT SOLUTION."

"INTELLIGENT SOLUTION," *he says*

LOOK, CAPTAIN, how recourse to Arc Welding affords intelligent solution to reconversion problems:

RECONVERSION SIMPLIFIED

FASTER TOOLING UP. Recourse to Arc Welding permits the shop to build its own jigs, fixtures and special machines . . . almost overnight . . . from standard mill shapes. The fixture shown is for assembly of a house trailer section.



LOWER COSTS! Recourse to Arc Welding allows greater freedom of design of the product...using any combinations of shapes or types of materials. NO patterns to make. Design and production can be constantly improved at minimum cost. Changeover of this bearing pedestal to welded steel cut cost from $138.70 to $71.35; cut weight from 395 lbs. to 280 lbs.

MORE SALEABLE PRODUCTS! Recourse to Arc Welding makes products stronger, lighter, more rigid and of improved appearance. Changeover of this frame of a bread-slicing machine saved 60 sq. in. of floor space, reduced weight 30%, increased accuracy of bearing alignment, cut costs 30%.

The Lincoln Welding Engineer nearby will help you solve reconversion problems with Arc Welding.

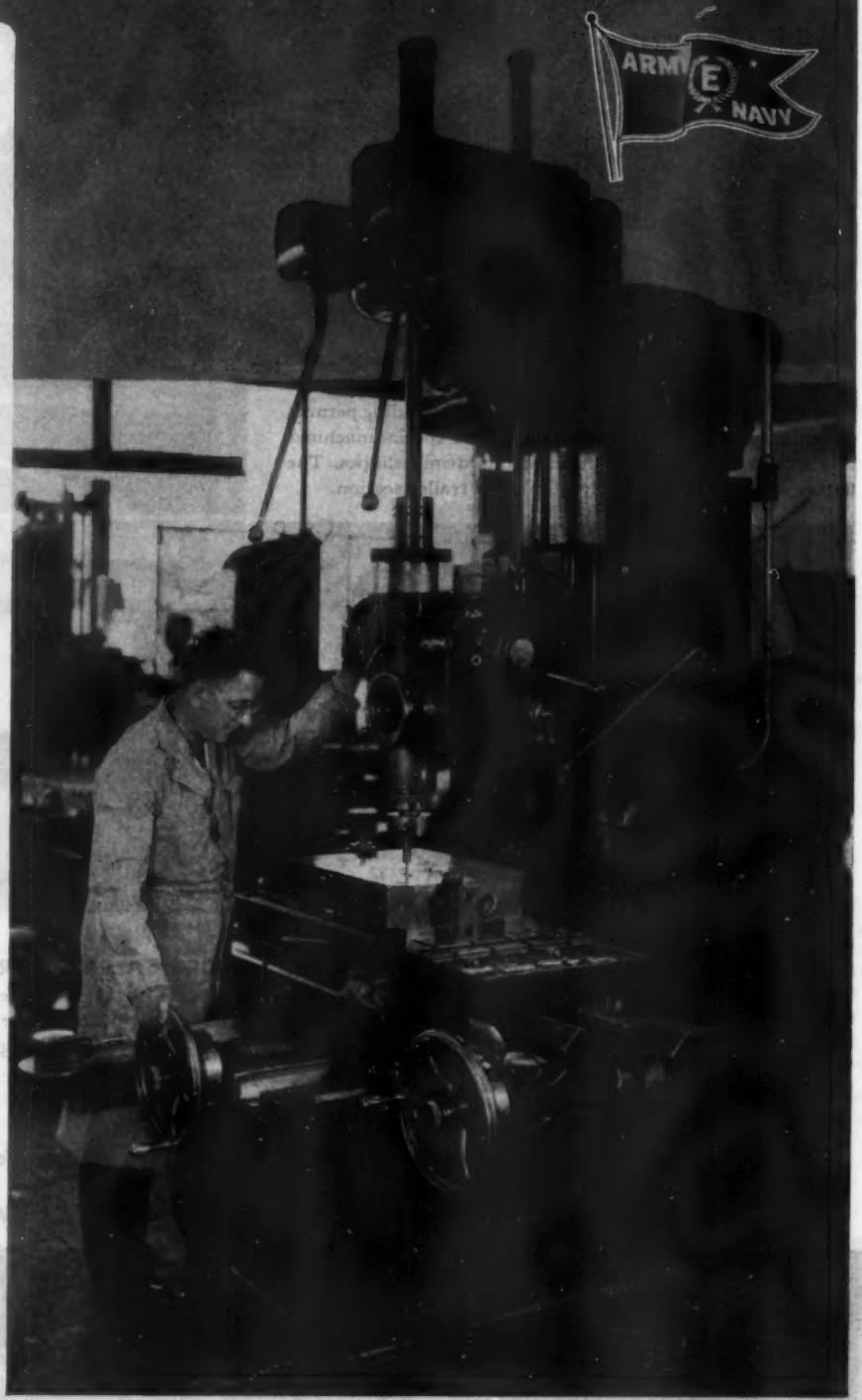
THE LINCOLN ELECTRIC COMPANY • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

Die and tool work demands accuracy of

FOSDICK JIG BORER



● On particularly close tolerance work, such as making the die illustrated, Fosdick Jig Borers are demonstrating their ability to meet the exceptional accuracy demanded in hundreds of tool rooms and tool and die shops.

The machine is exceptionally rigid—for example the bed of rugged construction is heavily ribbed to avoid distortion. A three point bearing serves for leveling and maintains perfect alignment. A sturdy sliding head supports spindle close to the work.

Operation is also very simple. All controls are centralized for ease of control. Twelve speeds in geometrical progression from 60 to 1500 RPM are instantly obtained thru a single lever. Nine feeds from .00125 inch to .010 inch are available thru a single control lever with direct reading index.

Thus the Fosdick Jig Borer offers all the advantages of high priced precision machines at a comparatively low cost. If you have a precision drilling—boring—facing or even light milling operation—put it on a Fosdick for speed—accuracy and low cost.

A full descriptive bulletin is available—ask for Fosdick Jig Borer Bulletin J.B.A.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23.··· OHIO

Another Outstanding Achievement by LE BLOND

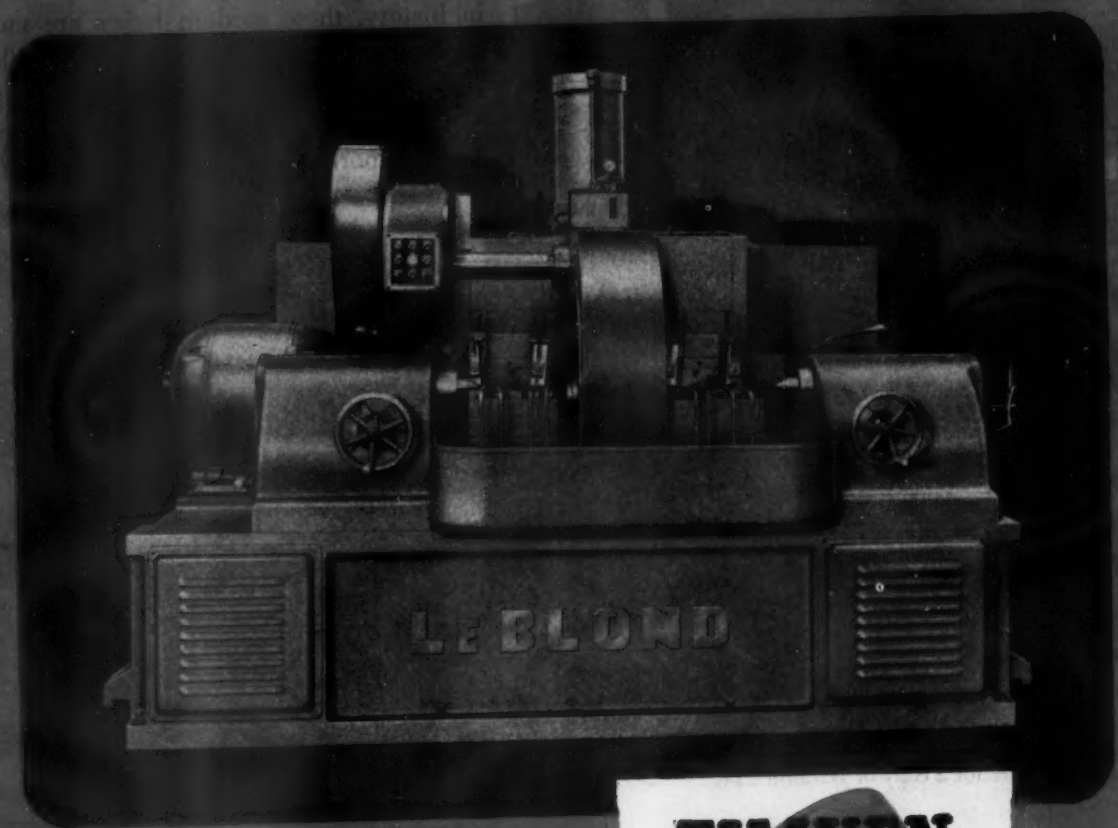
The post-war significance of war-time developments—such as this LeBlond No. 9-L Crankshaft Line Bearing Machine — can hardly be overestimated.

Under the whip of war production necessities, many operations are being performed faster, more accurately and more economically than ever before.

The machine shown here, for example, forms all the bearings, oil slingers, collar diameters and angular contours and cheeks all webs on large crankshafts for the more powerful aeroplane and truck tractor motors.

Speed and precision center in the two spindles between which the crankshaft is held lengthwise and rotated through a driving head powered by a 30/20 H.P. motor developing 1800/1200 R.P.M.

To provide the necessary rigidity and smoothness in the spindles and to protect them against radial, thrust and combined loads, they are mounted on Timken Tapered Roller Bearings — for LeBlond leaves nothing to chance. The Timken Roller Bearing Company, Canton 6, Ohio.



TIMKEN
TAPERED ROLLER BEARINGS

IN THE

Aircraft Industries

SOUTH BEND LATHES have long been popular for precision manufacturing operations and fine tool work in the aircraft industry. Today, in the greatest plane production schedule in history, these modern lathes are more than keeping their traditions for dependable precision and exacting tolerances. Providing lathes to most of the aircraft industry is one of our many important war assignments.

TRAINING HELPS

South Bend training helps—books, sound films, wall charts, and booklets on the care and operation of engine lathes and toolroom lathes—are available for facilitating the training of new lathe operators. Write for a copy of Bulletin 21-C.

BUY WAR BONDS NOW • • • SAVE FOR LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 38 YEARS • SOUTH BEND 22, INDIANA

Our sons are fighting to free the world from ignorance, intolerance and want . . .

. . . While some 6,000,000 of our people are wholly illiterate, and the majority of Americans have less than a completed high school education.

. . . While there were more than 3,000 strikes during the past year, some of the bloodiest of which were based upon race intolerance.

. . . While more than one-third of this nation's dwelling units are still without flush toilets or any bathing facilities whatever. Ignorance, intolerance and want!

America will soon have the chance to help write a peace plan for the rest of the world — and that plan can begin here at home. For our country's greatest immediate contribution to world reconstruction and peace would be to make ourselves lastingly strong, with jobs enough for all.

Today, the engineers of the machine tool industry can greatly help the men of government and of industry to write that plan . . . to prepare now for the reconversion of our tremendous wealth of resources, skills and machinery to all-out production for a better America! One of these engineers is a Bryant man, and we invite you to call upon him now.

BRYANT GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

DOES A *Good Turn* ON 1045 STEEL

SUNOCO
EMULSIFYING CUTTING OIL
helps rough turn 18⅝" spindle head at 265 S.F.P.M.

A good rule when you want a good turn is to use the right cutting oil. That's why so many leading metalworking shops rely on Sunoco Emulsifying Cutting Oil for all operations where a soluble oil can be used.

Just one example is the operation shown, where a large machine tool manufacturer uses a 20 to 1 mixture for rough turning the head end of a large spindle made of S.A.E. 1045 steel. Sunoco meets all requirements of tool life, tolerance, finish and speed. Sunoco's advantages can be applied shopwide, too . . . not only on turning operations, but for milling, boring, drilling, hobbing, slotting, grinding, etc. The high heat-absorbing and lubricating properties of Sunoco Emulsifying Cutting Oil aid in the prevention of overheating and drawing of the temper at the cutting edge. Chips do not seize . . . . tools cut cleanly, evenly, at high surface speeds.

In the reconversion period, just as during peak war production, metalworking plants will depend on Sunoco to give them maximum machining efficiency . . . with utmost economy. Now is the time to consider Sunoco Emulsifying Cutting Oil for your plant. Get the recommendations of a Sun Cutting Oil Engineer. Write . . .

SUN OIL COMPANY • Philadelphia 3, Pa.

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

PERFORMANCE DATA

OPERATION—Turn head end of spindle

MACHINE—Bullard 36" Vertical Turret Lathe

MATERIAL—S.A.E. 1045 Steel Forging

ROUGH TURN—18⅝" diameter

SPINDLE SPEED—54 R.P.M.

CUTTING SPEED—265 S.F.P.M.

FEED—.018"

DEPTH OF CUT—5/16"

CUTTING LUBRICANT—1 part Sunoco to 20 parts water

SUNOCO **SUN INDUSTRIAL PRODUCTS**

HELPING INDUSTRY HELP AMERICA

AIRCRAFT
LANDING GEAR STRUTS

Large scale production of Aircraft Landing Gear Struts includes a number of intricate operations — one of which is illustrated below. This job is performed at the plant of the Axelson Manufacturing Co., and employs the Super Service Radial to drill holes in forgings for end fittings at the exact angle in respect to the center line of the work. Precision locating, plus the precision-performance of the Super Service Radial results in the production efficiency so essential to the maintenance of a high output rate. Detailed information on the wartime performance possibilities of the Super Service Radial upon request.

THE CINCINNATI BICKFORD TOOL CO.

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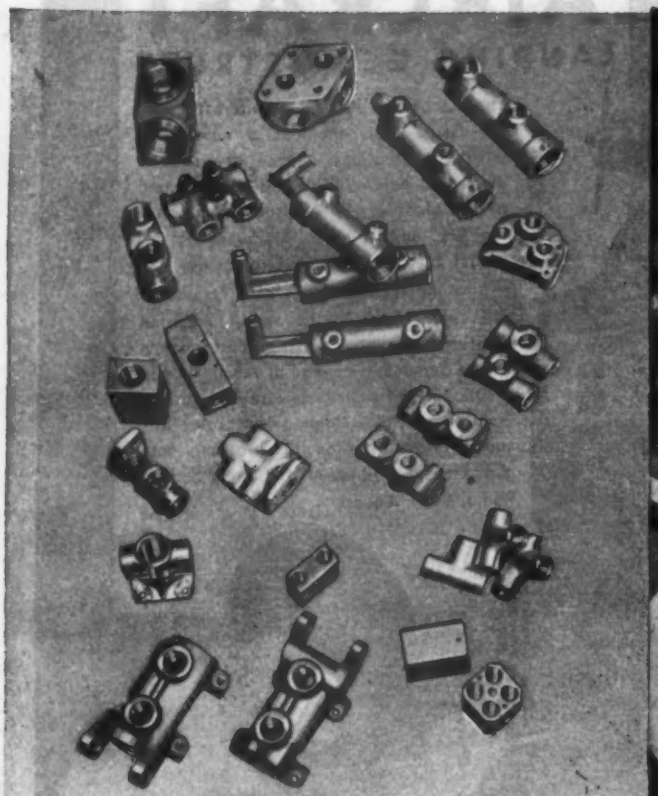

Precision Tapping

. . the Finishing Touch to a Perfect Part

THE Denison Engineering Company, Columbus, Ohio, makes a wide variety of aircraft parts. Cutting internal threads to Class 3 fit is usually the last of many precision machining operations on these beautifully-finished aluminum parts. A thread error at this stage means the loss of all previous time-taking operations through the scrapping of a costly piece.

Replacing old-type tapping machines with a new Warner & Swasey Precision Tapping and Threading Machine has resulted in an average time saving of 35%. On the particular operation, illustrated above, tapping a ⅛"-27 pipe thread in a Landing Gear Nose Body, Class 3 fit, with depth held to .010 accuracy, a Warner & Swasey No. 12 has increased production 100% over former method.

Very likely Warner & Swasey Precision Tapping and Threading Machines can show similar results for you. Your Warner & Swasey field man can explain how the patented principle of lead screw and solenoid actuated guide fingers can eliminate thread inaccuracies.

WARNER & SWASEY

Precision

Tapping and Threading Machines

4 Models—Capacities 0-80 to 1½" in steel,—to 2½" in soft metals and plastics.

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YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . .
WITH A WARNER & SWASEY

TURRET LATHES, SADDLE AND RAM TYPES — CHUCKING AND BAR TOOLS — TAPPING AND THREADING MACHINES

The Ruinous Spirit of "Stay Put"

BRITAIN no less than America will be cost-conscious after the war.

Britishers know that the production costs in some of their most vital industries are excessive. Moreover, manufacturing methods are wasteful of manpower. And as I have remarked previously on this page, manpower is Britain's most precious possession and will continue to be long after the war is won.

Cost gets back to mechanization. So does manpower. The more highly mechanized an industry, the higher the output per man and the lower the cost per unit produced.

A British cotton mission to America has just reported that cotton managements in this country, by contrast with those in Britain, are "machine conscious." The mission criticized British manufacturers for being too conservative in their attitude toward new machinery and new processes.

The same situation exists in Britain's coal-mining industry. Productivity per man is far less than in U. S. mines.

Other raw materials industries in Britain are being subjected to severe criticism for high costs growing out of the lack of modernization. The steel industry is an example. Automobile makers say that steel for postwar cars will cost too much unless early steps are taken to modernize steel mills.

The upshot of the present healthy self-analysis in Britain is sure to be a period of mechanization and modernization of British industry.

It is no longer a case of whether Britain can afford mechanization for the truth is that the nation cannot afford to be without it.

Mechanization will be a matter of economic life or death, the difference between Britain's remaining a first-class world power or slipping into a secondary position.

That is particularly true in connection with foreign trade and its expansion after the war.

Herbert Morrison, home secretary and minister of home security, said recently that the battle of the next few years in Britain will be a battle of production. The products of more than one of the great basic industries are costly because inefficiently produced.

If Britain's economic problems are to be solved, said Mr. Morrison, there must be a complete overhaul of these industries so that their great resources will yield a plentiful supply of commodities at competitive prices, efficiently made and paying proper wages.

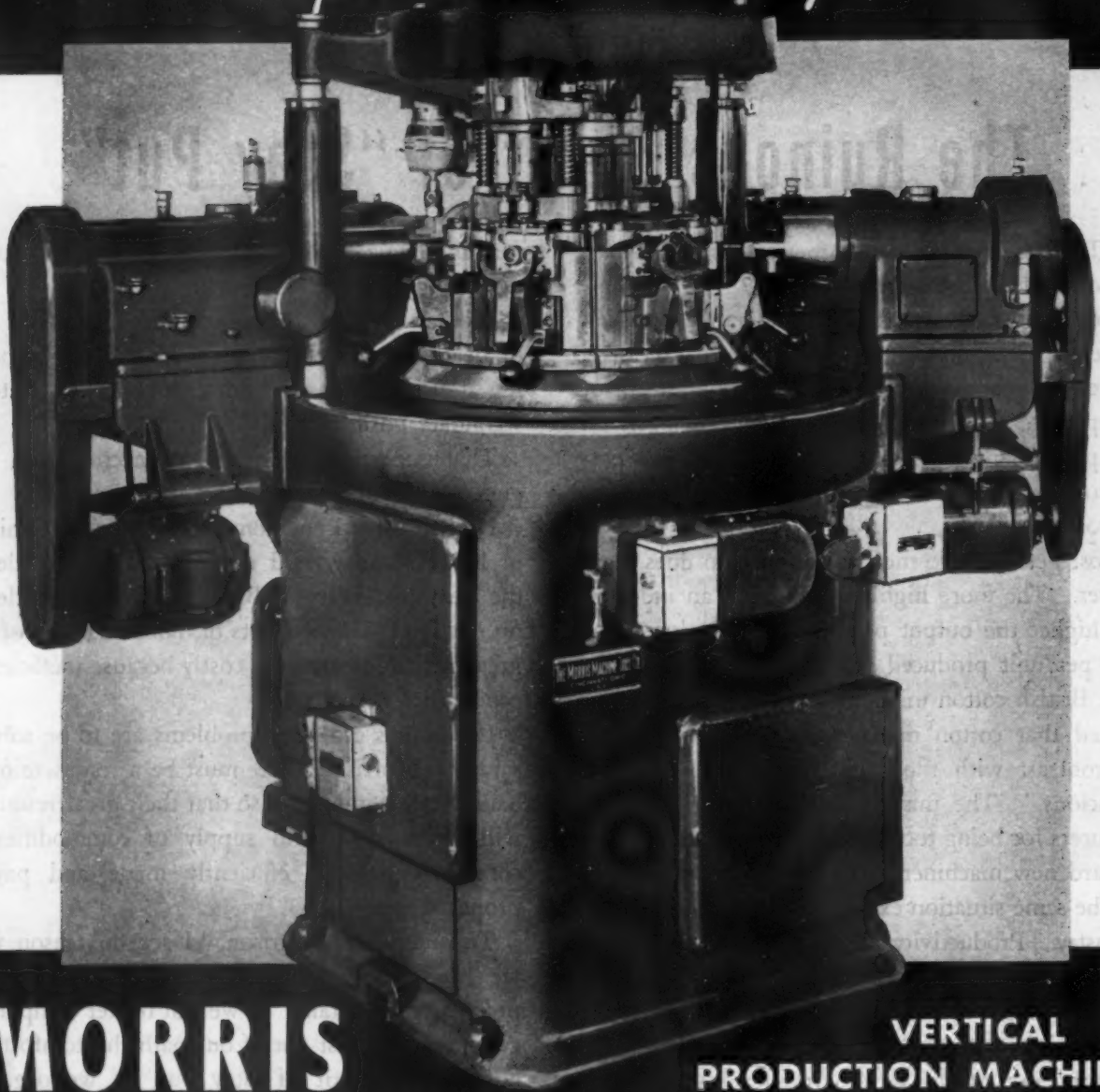
To quote Mr. Morrison, "I see no reason why we need wait a generation before we establish prosperity in Britain. If we can blister complacency, if we can blast out of our path the comfortable but ruinous spirit of 'stay put,' if we organize our skill and our talents, if we are prepared to put our backs into the job of increasing our national productivity, we can be within a few years on the high road to prosperity greater than our country has ever known."

Would it be out of order to suggest that Mr. Morrison's words make good reading for America as well as Britain as a guide to the future?

Burnham Finney

DRILLING — REAMING — FACING — COUNTERBORING — TAPPING & HOLLOW-MILLING

. . . 6 operations in one cycle



MORRIS VERTICAL PRODUCTION MACHINE

● Here's another time and cost saving Morris special production machine on which six different operations — Drilling — Reaming — Facing — Hollow Milling — Counterboring and Tapping — are performed simultaneously on each piece and a piece is completed at each index of the table.

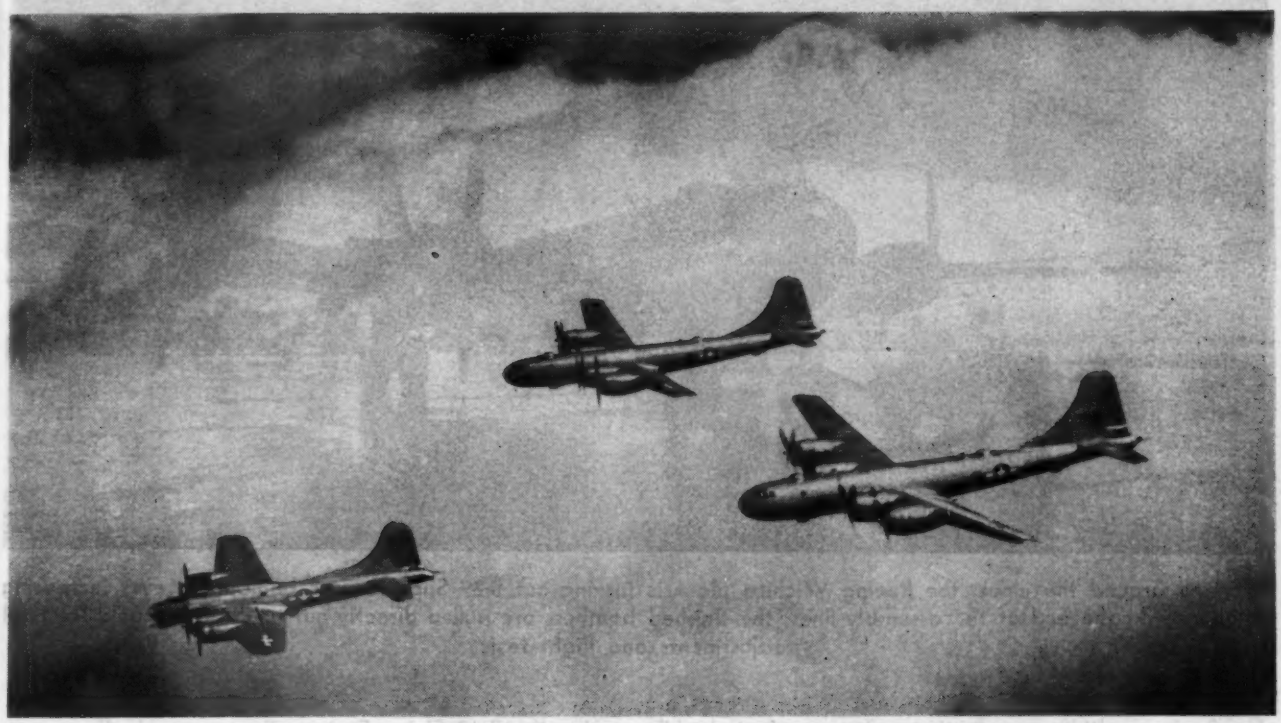
A vertical machine with center column hydraulic feed—automatic indexing table and horizontal heads. The vertical head carries a series of cluster heads with multiple spindles and bushing plates. The horizontal heads are mounted on the side, have individual motor drives and a rack feed actuated by the movement of the vertical head. Thus the feed of all spindles, both vertical and horizontal is synchronized. Production is exceptionally high.

If you have a job requiring these or similar operations on which mass production at low cost is essential—consult Morris—they have the engineering ability—facilities—and know how to help you.

Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO



Superfortresses have a wing span of 141.2 ft., a length of 99 ft. and a height of 28 ft. In comparison, the B-17 Flying Fortress has a wing span of 103 ft., a length of 75 ft. and a height of 19 ft. They have almost twice the engine horsepower of the Flying Fortress

Systematic Production Cycles Speed Superfortresses to Combat

Boeing's multi-line production system calls for the completion of all the major sections of the Superfortress on individual lines before going to final assembly

BOEING'S B-29 Superfortress four-engined bomber first took shape on drawing boards in Seattle more than four years ago—it was not pulled out of the hat as an answer to the Japs' Pearl Harbor challenge. Yet, in getting the B-29 off the drawing boards, into the assembly fixtures and finally into the air, it has been necessary to squeeze what normally would have been a six-year program into just two years. And because it is vitally needed by our fighting forces, the Superfortress is being produced in the greatest manufacturing program ever put behind a single implement of war.

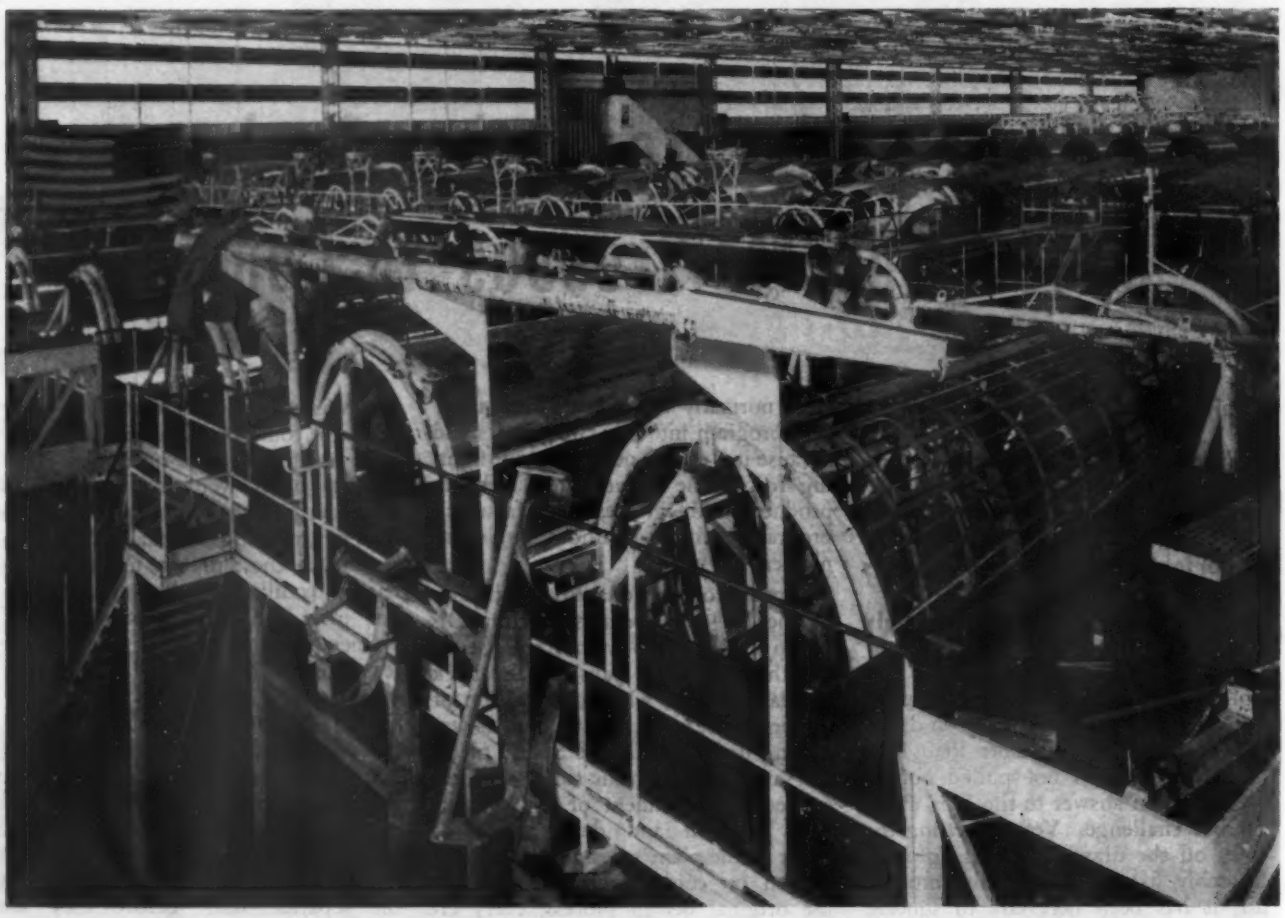
Preparations for quantity production of the B-29 at Boeing's Wichita Division was first authorized seven months before the Japs' sneak attack at Pearl Harbor, while construction of the first three experimental models was getting under way at the Seattle plant. To save time, precious time as events proved, establishment of the production program and development of many of the plane's design details were carried on concurrently. Throughout the original design process, every effort was made to engineer the plane so that it could be manufactured rapidly in relatively large quantities. Production plans were made and tools were designed with the prime objective of reducing fabrication and assembly to the simplest terms so that hastily recruited, quickly trained workers, including a large proportion of women, could build the plane in the least possible time.

Broken Into Five Sections

From the start, manufacturing plans were based on the Boeing multi-line production system which had proved so efficient for the production of the Flying Fortress. This system involves the pre-completion of major sections on separate lines before they are

Working around the clock, the Boeing Wichita plant is turning out B-29 Superfortress bombers in ever increasing numbers. At the end of the assembly lines, the finished bombers are pulled directly out to the flying field for final adjustments and flight tests

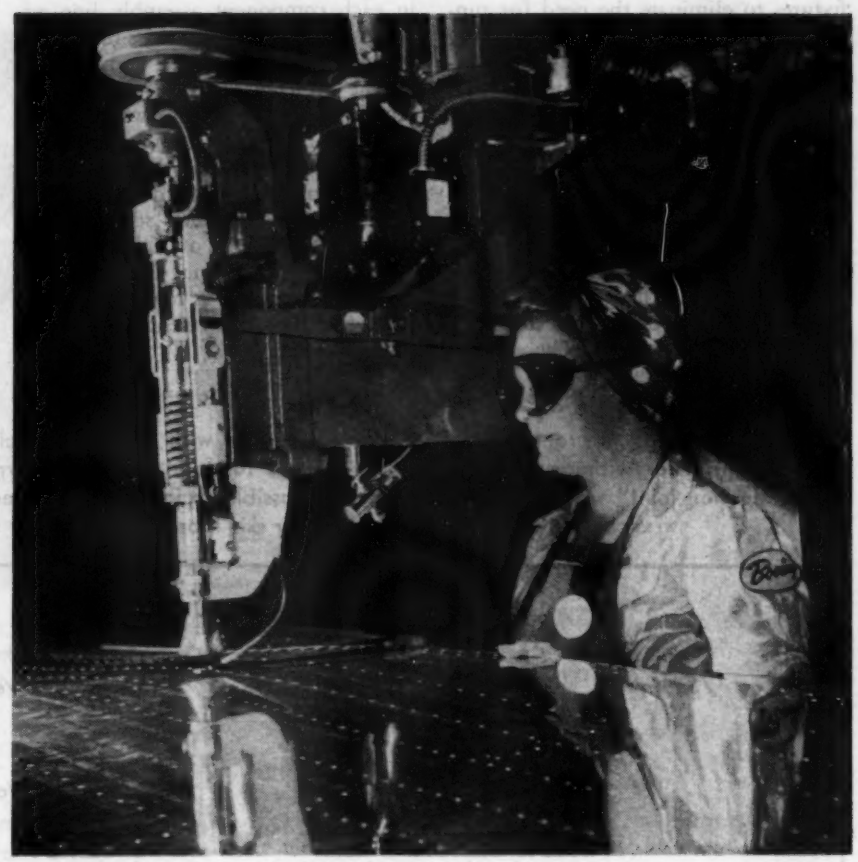
The Boeing multi-line production system, perfected while making the B-17 Flying Fortress in mass-production quantities during recent years, has been adapted to the manufacture of the B-29 Superfortress. It involves the pre-completion of major sections on separate assembly lines before final assembly of the plane, and makes use of huge, rigid assembly fixtures to insure interchangeability of major subassemblies



brought together for final assembly. For example, the B-29 fuselage was broken down into five sections for major assembly; preliminary tool design work for these sections and other parts was started by tool engineers at the Seattle plant. The Wichita Division undertook the job of detailed tooling for B-29 production at the plant in September, 1941, the same month in which the first experimental plane, the XB-29, was given its first taxi and flight tests.

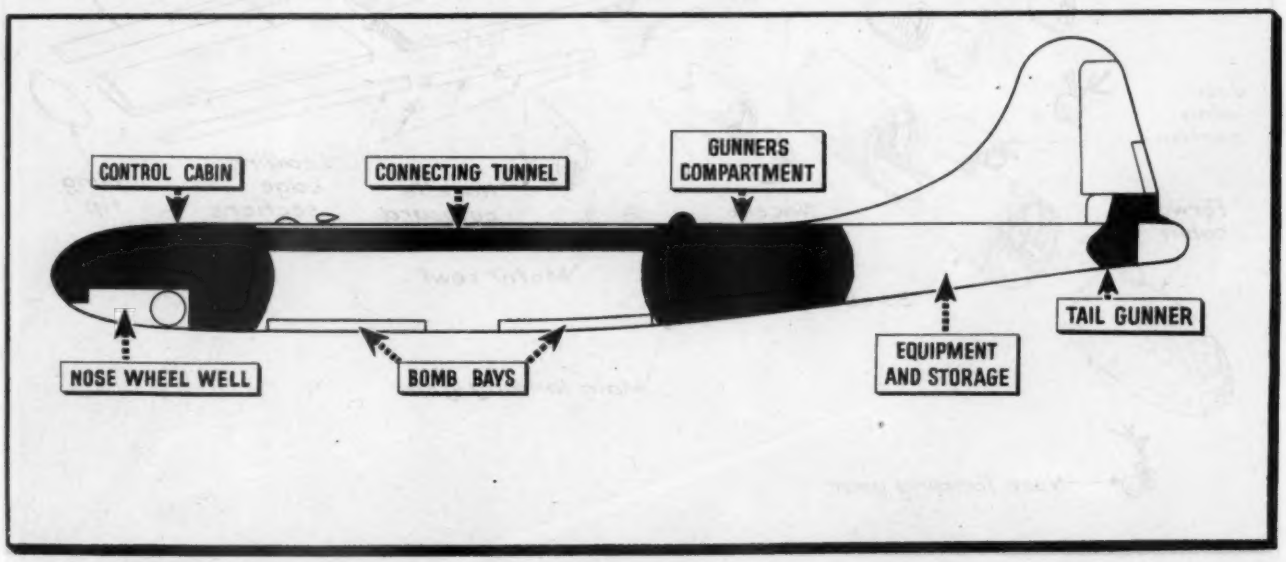
Masters Made for Wichita

Under the B-29 production program, master gages were designed and made at the Seattle plant for all B-29 work, in order to insure interchangeability of all major parts, no matter where built. These master gages were used at Wichita to set the tools and assembly fixtures constructed there. The first major fixtures for the wing and fuselage sections also were made at Seattle —these set the trend for tool engineers at Wichita to follow in designing the other tools required. Basically, design of the jigs, fixtures and other tools for the Superfortress follows closely that employed when making tools for the B-17. They provide ample rigidity for holding the structures to the precision tolerances required and, at the same time, provide a maximum of working room. Wherever possible, the large assembly fixtures have three-point support from the floor to minimize twisting and misalignment due to mounting them on an uneven floor. Tube lighting units are built into the



Sections of Alclad aluminum-alloy skin sheets are drilled through undersize pilot holes in stringers by the skin fitting groups. These skin sheets then are taken to nearby Farnham machines where holes for all external rivets are countersunk. Holes in skin sheets for Cleco fasteners are countersunk at assembly after rivets have been driven in the other holes. Sealing tape is applied to skin sheets for the pressurized sections before riveting

Pressurized sections of the B-29's fuselage are shown in black in the diagram below. The forward control cabin, housing the pilot, co-pilot, bombardier, navigator, flight engineer and radio operator, is connected with the midship gunner's compartment by a long, circular "tunnel" which spans the non-pressurized bomb bays and is large enough for a man to crawl through. The tail gunner's compartment also is pressurized



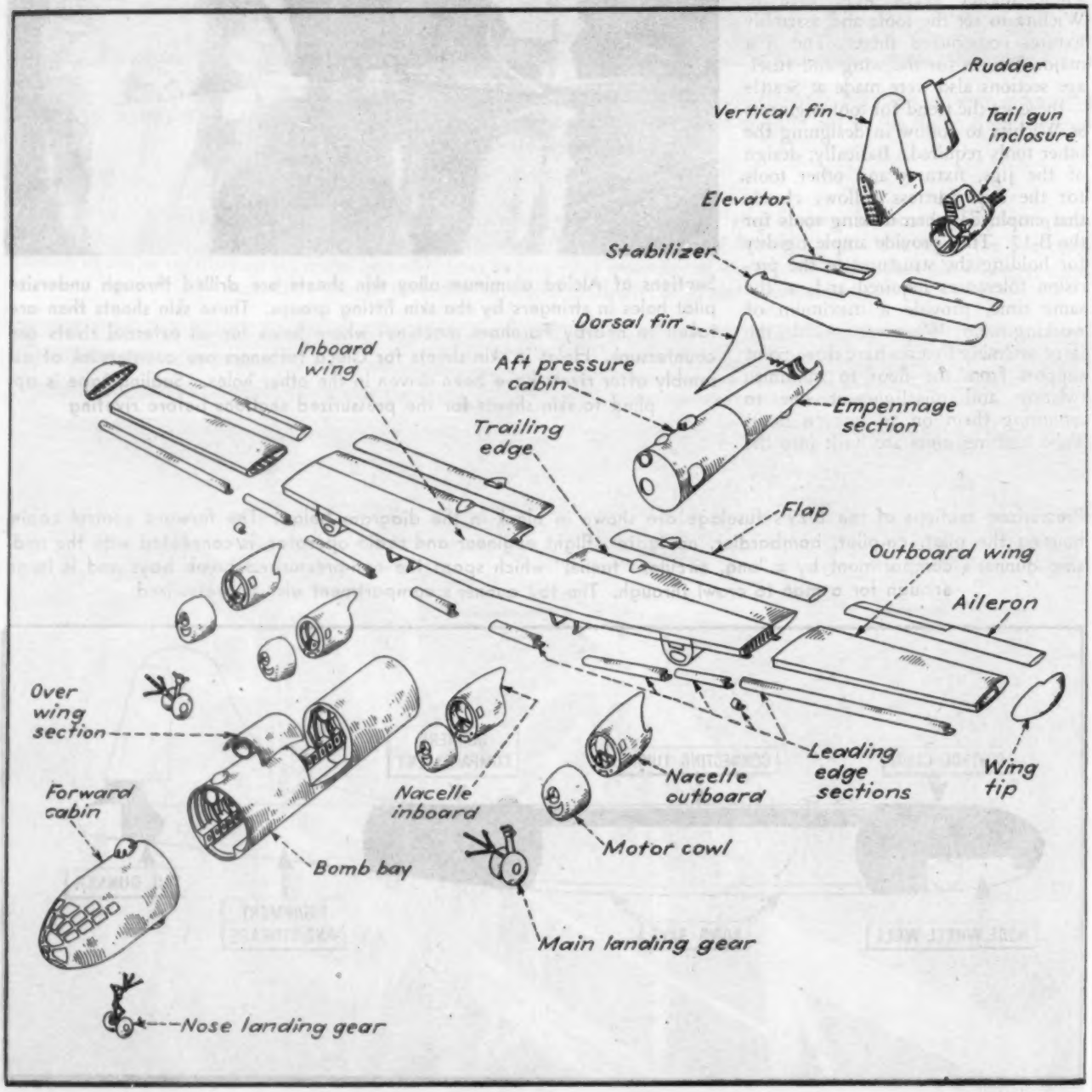
fixtures to eliminate the need for running extension cords into the working area, and convenient outlets for electrical and compressed air lines are provided wherever hand power tools are needed.

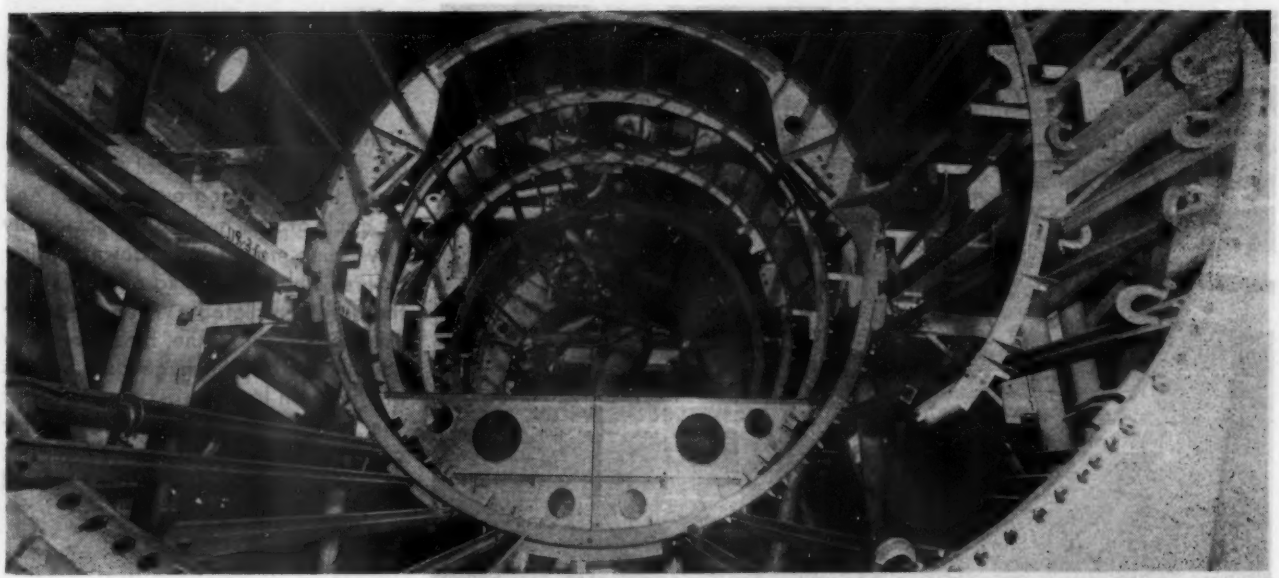
Assembly Cycles Fixed

A systematic schedule of production cycles has been worked out for the multi-line assembly of major components, and on the final assembly floor where these components are joined to form the finished plane. The sections in each component assembly line advance one position in a mass movement at the end of each 6 hr. and 40 min. on the present schedule. On final assembly, the cycle is somewhat longer. Movement of the sections on the production floor starts at the same time, each section being moved forward one position and a finished section being moved from the end of each line, ready for delivery to the final assembly floor. About two minutes is required to complete the mass movement on the production floor.

In each of the component assembly lines there is at least one spare position which is used to clean up any operations not completed in previous stations so as to insure a completed section going to the next line. In the major jigs, where it is impossible to move the units at the end of each operation and the crews are moved instead, there are two spare positions. One of these serves as a "clean-up" or cushion position to permit finishing any operations not completed in the scheduled time cycle, or to give time

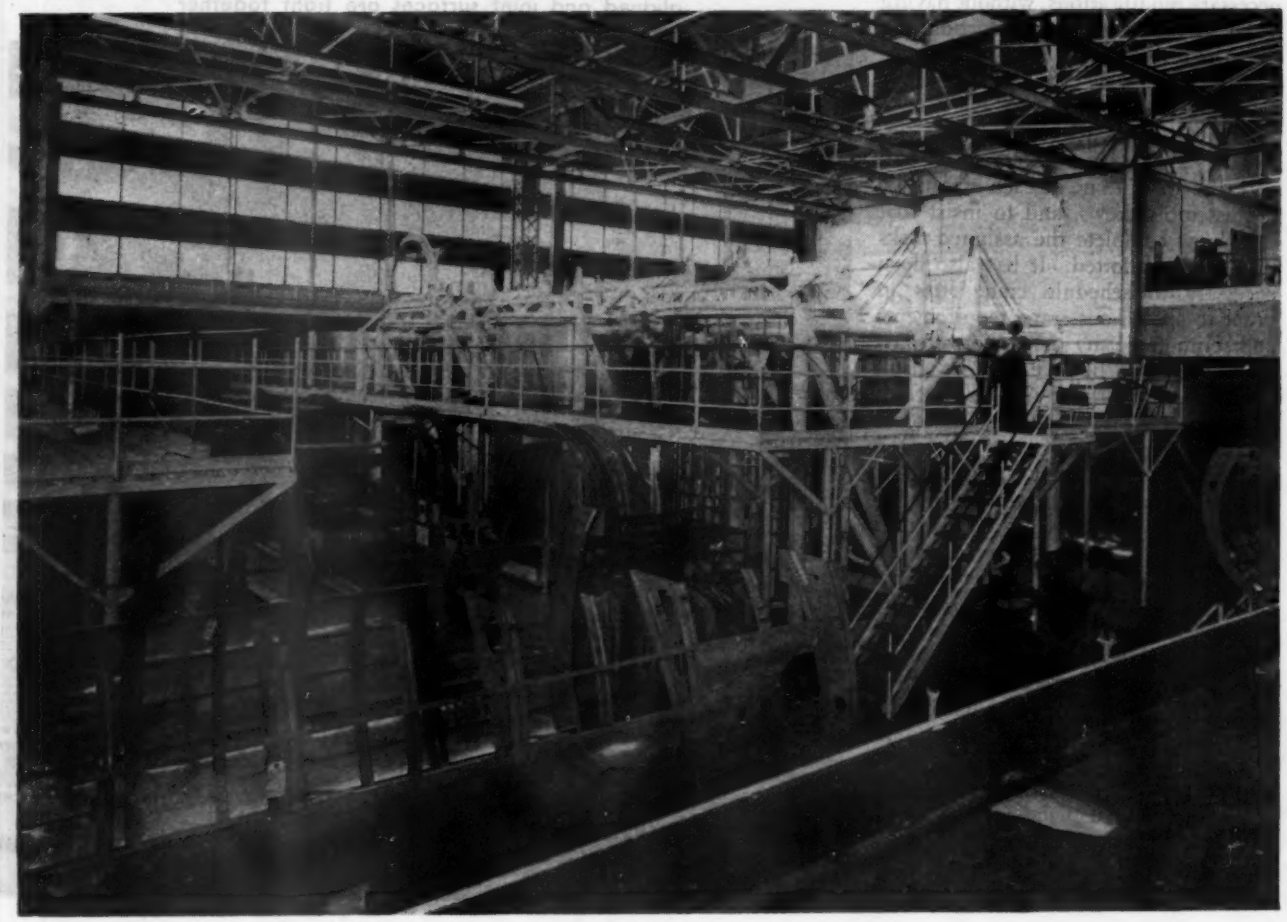
Throughout the design process, the B-29 was engineered with a view to facilitating rapid, quantity production by workers unfamiliar with airplane manufacture. The fuselage is broken down into five sections for major assembly. A "production joint" was developed to make it possible to join the major sections together with bolts, using torsion wrenches, and no splicing of beams or skin laps is necessary at final assembly stations

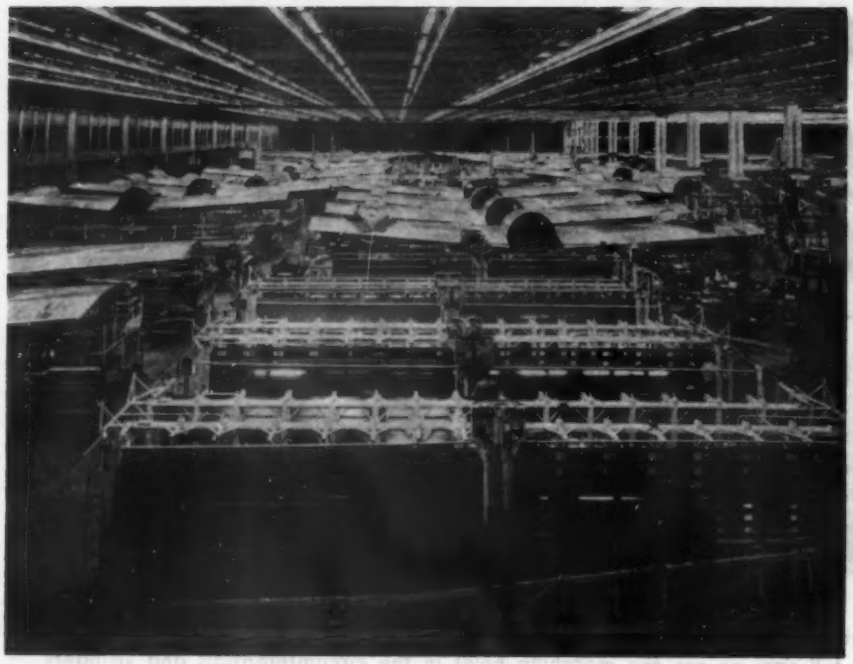




Unlike the Flying Fortress, stringers in the B-29 fuselage sections do not pass through slots cut in the circumferentials. Instead, stringers and circumferentials are joined with clips and the skin panels are riveted to the stringers. Rivet holes in the clips are pre-punched full size, as are the matching holes in the circumferentials and stringers

First assembly operations on bomb bay half sections are performed in large vertical fixtures. The half sections later are joined together in horizontal fixtures nearby. Fixtures used for the manufacture of B-29 sub-assemblies are designed for holding the structures to the precision tolerances required and to provide workers with a maximum of room. Tube lighting fixtures are built in the fixtures, as are covenient electrical and compressed air outlets





Center or "inboard" wing sections are assembled in vertical positions in large fixtures (foreground) at one end of each of the main plane assembly bays, then moved to laydown holding fixtures (center background) where they are completed. When ready for assembly to the plane, these units are complete with the huge dual wheels of the main landing gear and two of the four 2,200 hp. engines. Master gages are used at frequent intervals to insure continued accuracy of all assembly fixtures

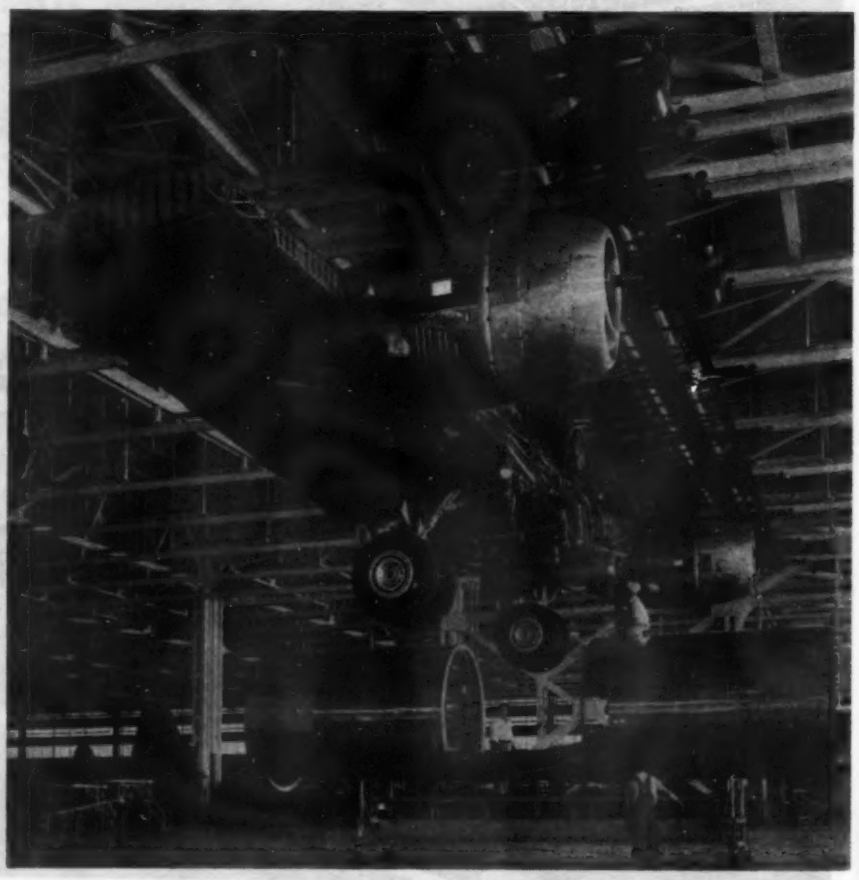
for the repair of work not passed by the inspectors. The other spare is left open for the length of one time cycle in order to permit the tooling department to check the fixtures periodically with master gages, and to make any necessary modifications, without having to take a fixture out of production and unbalance the lines.

Balanced at Each Station

To make this system function efficiently, it has been necessary to balance the work done at each station by the assembly crews, and to insist that each crew complete the assigned tasks in the time allotted. It has also been necessary to schedule crane lifts in order to spread out crane requirements and eliminate any need for an assembly crew to be idle while waiting for a crane. Each of the major component assembly lines consists of a series of large fixtures in which the assembly is constructed, and a line of movable carriages to which the assemblies are moved from the fixtures for finishing operations. Structural work which cannot be completed in the fixtures is done when the assemblies have been moved to the carriages, and as much as possible of the equipment to be installed in the section is mounted and connected. As much assembling as possible is done in the major component lines, and in the manufacture of minor assemblies, in order to reduce work on the final plane assembly floor to the minimum. Final assembly of the plane is confined mostly to the joining

(*Continued on page* 90)

The two 10-ton cranes are called into united operation for assembling the 17-ton main center wing section in the bomb bay section on the final assembly floor. As the two units are made for a precise fit, the bomb bay section is jacked up in the center to allow a 1/4 in. spread as the two sections are mated. Removal of the jack results in a joint in which pre-drilled holes are aligned and joint surfaces are tight together



HIGHLIGHTS OF THE B-29 SUPERFORTRESS

General H. H. Arnold, commanding general of the U. S. Army Air Forces, has described the B-29 as an airplane which places previous four-motored bombing craft in the "light-heavy class." Its dimensions, range, load carrying capacity, service altitude and speed bear out this statement. Exact figures on speed, range, altitude and bomb capacity still are restricted—but the following facts can be told:

The B-29 is long and cylindrical in shape, with slender tapering wings. It is half again as big as the B-17 Flying Fortress, also a product of Boeing's design boards. It has wingspan of 141.2 ft., a length of 99 ft. and a height of 28 ft. In comparison, the B-17 has a wingspan of 103 ft., a length of 75 ft. and a height of 19 ft. Gross weight is about 60 tons, approximately twice that of the Flying Fortress.

Four Wright Cyclone 18-cylinder radial air-cooled engines, rated at 2,200 hp. for takeoff, power the B-29. The total of 8,800 hp. is nearly twice the 4,800 hp. total of the four B-17 engines. The B-29 carries a bigger bomb load, has a longer range, higher speed and greater service altitude than any other bomber in the world. Its 16½-ft. diameter four-bladed Hamilton-Standard propellers are the largest ever installed on any aircraft.

It is a midwing all-metal monoplane, flush riveted and butt-jointed externally throughout. Aerodynamically, it is the "cleanest" large plane yet designed. When on the ground, its weight is supported by a tricycle landing gear with double wheels on all three units. The B-29 is the nearest any plane has yet approached to being all electrically operated. About 150 electric motors give remote control of all elements except the control surfaces, which are operated "direct" through cables, and the brakes, which are hydraulic. The landing gear is completely retractable and fits into wells whose doors close flush for streamlining. Drag is doubled when the landing gear is down.

The fuselage is all-metal, of semi-monocoque design, with an aluminum alloy stressed skin. It is broken down into five sections for major assembly, and is a complex arrangement of pressurized and non-pressurized areas. Forward control cabin and the gunner's compartment in the waist are pressurized, as is the tail gunner's compartment. The nose and waist compartments are connected by a pressurized tunnel spanning the non-pressurized bomb bays.

The Boeing's "117" wing, designed especially for high loading to carry the great weight of the B-29, possesses qualities exceeding those of any previous wing design. The new airfoil section incorporates a set of unusual wing flaps which, when extended, add nearly 20 percent to the total wing area and give the plane its short takeoff and landing characteristics. Wing structures are of web-type construction, differing from the tubular-spar construction used in the Flying Fortress. The web-type design is simpler to manufacture and allows more room for gasoline tanks in the wings.

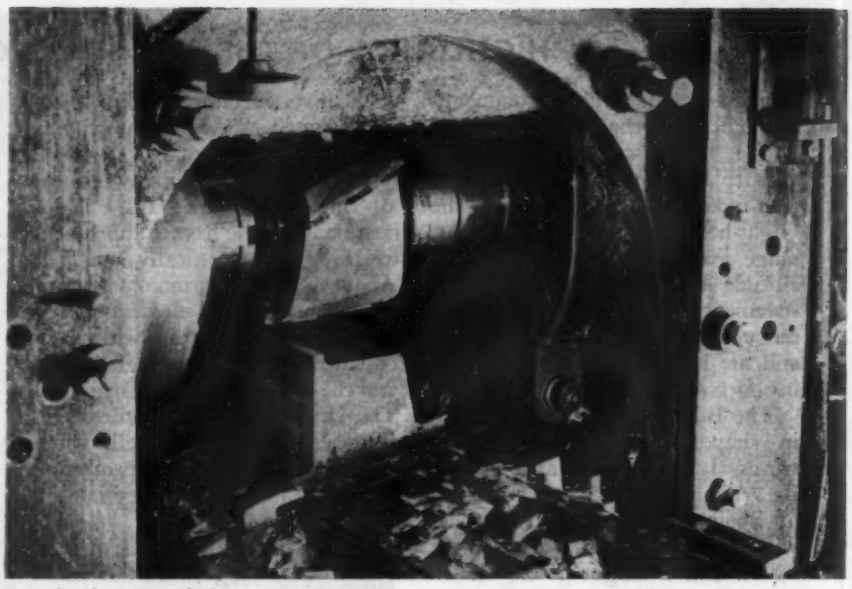
Five sets of multiple guns in remotely-operated power turrets give the B-29 a strong defensive system. All of the turrets mount 0.50 caliber machine guns; in addition, the tail turret has a 20-mm. cannon. All guns are fired by a remote control system that features the use of automatic computers which correct for range, altitude, temperature and air speed. Should the computer system be damaged in combat, a turret can be operated from the gunner's sight independent of automatic computing.

The manufacturing program for the B-29 dwarfs anything previously attempted in the aircraft industry. It embraces hundreds of subcontractors, vendors and suppliers, as well as the five huge plants where the planes will be built. These latter plants include the Boeing factories in Seattle, Renton and Wichita, the Glenn L. Martin-Nebraska Company plant in Omaha and the new Bell Aircraft Company plant in Marietta, Ga. In addition, Briggs, Cessna, Chrysler, General Motors, Goodyear, Hudson, Murray and A. O. Smith are producing major subassemblies.

On the final assembly floor the B-29 Superfortress takes its final form quickly as the various finished sections are joined together and bolts are tightened. When the assembly has been completed, and control cables, electrical lines and hydraulic lines have been joined, every operating unit in the plane is checked and rechecked to make sure it will function properly in the air. Final assembly operations are, in so far as possible, only joining operations; most of the assembly work is performed before the subassemblies reach the final assembly floor

of the sections and the connecting of electric wires, control cables and hydraulic lines.

On the production floor, riveters are kept supplied with enough rivets for the jobs at hand by rivet chasers or clerks who watch the progress of the work and go to nearby refrigerated rivet storage boxes for additional rivets as they are needed. Small paper bags are used for delivering sufficient rivets for a given operation. This keeps rivet losses to a minimum and insures that only properly heat-treated aluminum rivets are used. The rivet storage boxes on the production floor are kept filled by small power trucks that operate on definite schedules between the heat-treating department and the production floor. On each of these trucks is a mechanical refrigerating unit that is well insulated so that temperature is held within close limits during the time the truck is away from the heat-treating room. While restocking the truck, the driver plugs in the cord from the truck's refrigerator unit to an outlet near the loading stations. This keeps the temperature in the truck box at the low level required.



A heavy extruded duralumin chord, the largest extrusion ever used in a production airplane forms the cap of a web spar for the Boeing "117" wing of the B-29. It weighs 255 lb. when machined. Farnham spar millers with special carbide-tipped cutters are employed for most of the operations on this spar chord. The cutter shown has four teeth tipped with spaced bits; it is 4 in. in diameter and is used at 3,500 r.p.m. with feeds of 140 to 180 in. per min. Two 20-hp. motors drive this cutter

Designed and built by Boeing-Wichita, this special horizontal-spindle contour router form mills the sides of small spars for the web-type wing of the B-29 Superfortress. Spindle speed for the ⅜ to ½ in. diameter cutter is 8,000 r.p.m. A bar cam at the far side of the table controls the height of the cutter above the table. The machine cuts in both directions, roughing on the first pass and finishing on the return pass of the cutter along the aluminum-alloy spar piece

Ring bulkheads for the Superfortress are drawn in steel dies from 0.040 in. thick Alclad 24S-0 aluminum alloy. The 42.0 in. diameter blank is swabbed with oil before drawing. The 750-ton Clearing press has a slide stroke of 33 in. and can be operated at a speed of three strokes per minute

Machine Tool Plan Would Give Orderly Disposal of Surplus

BY R. L. GIEBEL, GIEBEL MACHINE TOOL COMPANY

Manufacturers are advised to establish uniform charges for overhauling government-owned equipment before it is resold

ESTABLISHMENT of an orderly procedure for the distribution of surplus machine tools as hostilities draw to a close will represent a vital contribution to smooth industrial reconversion. There has been considerable discussion as to the most efficient way to dispose of government-owned machine tools but no concrete action has been taken to date.

It has been suggested that all standard machine tools now in government possession be returned either to the original builder or some other responsible company for overhauling, and then be redistributed through regular sales channels. The procedure could be made very simple and would have real merit if the government officials used good judgment and understood the problems involved.

The age of a machine may not indicate its condition. A machine used continually in one plant may be in better condition than a similar machine which has been abused in another plant. It is virtually impossible to learn the true condition of a machine unless it is dismantled and all parts inspected. Some machines may be in such poor condition that they should be scrapped immediately and thereby save much wasted effort.

Uniform Prices Urged

If the complete overhauling and redistribution plan proposed is adopted, a uniform selling price should be established, based on the age of the machine. From that price should be deducted an overhauling and rebuilding cost, selling expense, and freight and cartage charges. The government should receive what is left. This would make it possible for all used machines to be sold at a predetermined price, and the purchaser would be sure of getting a true value. The government would receive a fair return, and speculators would be eliminated.

Regardless of the redistribution method employed, the machine tool manufacturer and distributor will have their problems. Everyone who buys, sells or uses a machine tool recognizes the problems both in retooling it and in keeping it up to maximum efficiency. Machine tools produced today are far superior to those made 10 or 20 years ago, but they must be serviced and repaired from time to time. Of course this condition is exaggerated under war conditions when machines are likely to be operating 24 hours a day under inexperienced supervision and by unskilled operators.

Machine tool builders and their distributors have done a magnificent job in helping with retooling, servicing and assisting the user in ordering

repair parts during the war. Most of this has been done at little expense to the user. When business returns to normalcy, however, this costly service will become a major expense item. Someone must pay the traveling expenses of the engineers and service men. The cost must be either included in the price of a new machine or charged directly to the customer.

The time required for the initial inspection of a machine, which is often required before the service man arrives at the plant, is a costly item. Because of the scarcity of certain materials, the design of many machines has been changed even during the height of production. This means that regular service books and catalogs are often obsolete. Other machines have been changed by the users to accommodate special jobs. These machines are sometimes sold innocently as standard tools, and the purchaser finds he must replace the special attachments in order to have the standard machine he thought he was buying.

There seems to be no way of anticipating the amount of service that a machine tool will require. Some shops expect continued attention from the manufacturer while other plants do not want the manufacturer's representative to see the machine after it is once installed. Some small shops are supervised by men who have great initiative and take pride in overhauling and repairing their own machines. Other small shops are afraid of the machine and expect the manufacturer's service man to tighten a loose nut and do other simple tasks.

Transfer of Used Machines

Many machines in use a year or more are being transferred from one facility to another. The new users generally need the immediate help of engineers or service men because a transferred machine is seldom in excellent operating condition and often needs servicing.

This transferring of machines will reach even greater proportions as the war ends. No one expects the government to put all machine tools under "the hammer." Some use will be found for all the surplus equipment, except machines for special operations. Despite new designs, which in many ways have already obsoleted machines now being sold, the older tools will have a real value to someone. The service necessary to return them to operation will be extensive. It would be a catastrophe if all machine tool manufacturers refused to help retool or service their equipment if it was not in the hands of the original buyer.

It is recommended that machine tool manufacturers establish at this time uniform charges. The prospective buyer of machine tools is entitled to know what help he can expect and how much it will cost him. A sound policy announced now would certainly help to simplify the government's problem of redistribution.

Fig. 1—A paneled steel part used as a bottom for paper board spice cans which was made in a single station combination drawing and blanking die

New Dies and Equipment For a Postwar Product

BY C. W. HINMAN

INTEREST at present is centered in a machine that will produce steel tops and bottoms for small paper containers at a rate of 200 or more per minute and that will automatically assemble them on the open ends of the paper board bodies. Such a machine should allow easy interchangeability of the drawing, blanking, folding and final assembly mechanisms for fabricating the varied sizes and shapes that will be required.

The major problem involved in the development of such a machine is design of the dies, which will necessarily include the incorporation of principles used in the design and operation of progressive dies. Another point is that some form of continuous movement of the finished parts must be provided to the point where final assembly on the paper body of the containers is to be made. As a machine for producing 15 or 20 different sizes of plates will probably be necessary, a large amount of engineering design is involved.

In Fig. 1 is shown a can bottom, $1\frac{3}{8}$ x $2\frac{1}{8}$ in., which was produced in a combination drawing and blanking die from SAE 1010 strip steel. The details of the part are shown in Fig. 2.

In Fig. 3 are shown the outside cut edges of one of these parts, which has been attached to a paper box body. The edges have been folded inward 180 deg. on the margin to avoid cutting the paper body when the metal is folded up in the assembly of a unit, as shown in Fig. 4. The cover is a duplicate of this bottom part and is assembled in the same way. In some cases the cover has a central opening through which the contents of a container can be poured.

The initial step in designing a high-speed progressive die for any new product is to lay out the scrap strip showing the consecutive order of die operations. These must conform to good standards of die construction, suitable for the press to be used, be practical from a diemaker's viewpoint, have trouble-free action, secure maximum output and provide for easy delivery of the finished parts.

Fig. 5 represents the steel parts of the die, assembled in the die set. This design was made from the scrap strip layout and the position of the punches are at the completion of the down stroke of the press. This is an unusual die, as it was necessary to incorporate a transfer slide for positioning the work in the last station.

This piece of work is easy to draw, cut and form, because the panel is comparatively a shallow draw and the material is "dead soft" steel, of light gage, 0.00859 in. The die drawing shows all the cutting die openings and piloting holes in the plan view, section lined for clarity. Strip is fed from coiled stock by an automatic roll feed and enters the die on its right side, first over spring pad *A*, which has two strips, *B*, that guide it. The usual finger stops, not shown, are depressed at the starting stations to facilitate entering a new strip.

Station 1.—The panel is drawn up

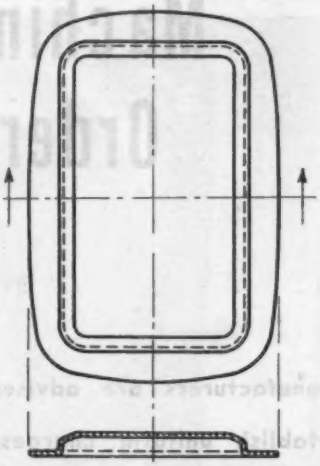


Fig. 2—Plan and end design of the SAE 1010 strip steel part used on spice containers. Many sizes and shapes of these tops will be required, the tops having a variety of openings

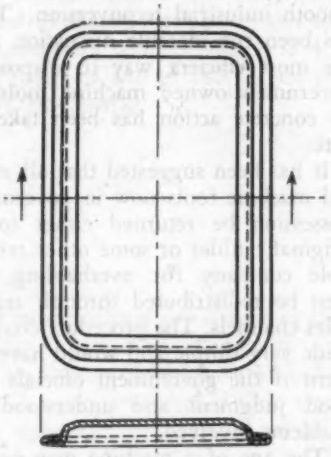


Fig. 3—The steel part after the edge had been formed and folded to 180 deg. to prevent cutting of the paper body of the container during assembly of the parts

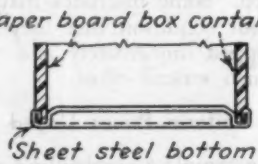


Fig. 4—Final assembly of the steel part in the end of a paper board container. The straight sides around the panel provide a positive stop within the box against which the outside contour of the metal piece is drawn

into the die opening in punch *C*, the latter being attached on the punch holder of the die set, and *D* is the drawing punch which is attached on the die shoe and aligned with the die in punch *C*. When the ram descends, the punch draws up, the panel continues to descend and the strip is held between the faces of *A* and *C*, which act as blank holders. At the extreme down stroke, the panel is finished and its margin is "spanked" between the faces of the punch and pad, when the latter "banks" against positive block *E*. On the up stroke, pad *A* follows up under the work and lifts the panel from the punch when the surfaces of *A* and *D* are flush. As the ram continues to ascend, ejector plate *F* pushes the finished panel out of the die.

Stations 2 and 3. — Between these stations, notching punches *G*, in descent, one at each side of the strip, cut the contour edges on two sides and tops of the blank. The correct shape for the blank has been determined previously by experiment, so that it can be drawn up and folded down correctly at subsequent stations. The punches, *G*, are provided with guiding heels that enter the die ahead of the cut and prevent mis-cut and nicked edges on both the punches and dies. On the up stroke, the work is stripped from the punches by a positively attached stripper plate *M*, which covers stations 2, 3, and 4.

Many kinds of products such as used in practically every home will require vast quantities of containers, with sheet metal tops and bottoms to be produced by special equipment

Station 4.—Between stations 3 and 4, two pilot punches *J* enter the contour slots previously cut and align the strip and work, ahead of all other operations. Station 4 is idle, because it was necessary to align the strip with the pilots and provide sufficient space between stations 4 and 5 for severing the blank from the strip with cutting off punch *K*.

Station 5.—This is the transfer slide station, where the forward end of the strip is halted against positive stop *L*. It is a drawing operation in which the edge of the blank is "thrown up" as shown in the front elevation and prepared for folding over flat, as in Fig. 3.

Drawing die *M* is simply a plate ¼ in. thick, and drawing punch *N*, in descent, draws the blank through the plate, throws up its edge and on the up stroke "strips" off the work under plate *M*. The drawn work is now free to slide by gravity down through chute *O* to position *P* in station 6, where it is halted by a short stop pin.

Station 6.—The work piece is finished here. Punch *Q*, in descent, first contacts the upturned edges around the work, as shown in Fig. 7. The concave curling edges around the punch opening repositions the work correctly, if it should be slightly away from its proper location. Continuing to descend, punch *Q* curls in the upturned edge and "spanks" it down flat, as shown at *P* in the front and end elevations, and in Fig. 3. When the punches ascend, the finished piece is blown over the stop pin from underneath by a timed action of compressed air. The parts can be blown into a hopper and then led out into a chute by gravity for further operations, such as the assembly on the ends of the paper box body as shown in Fig. 4.

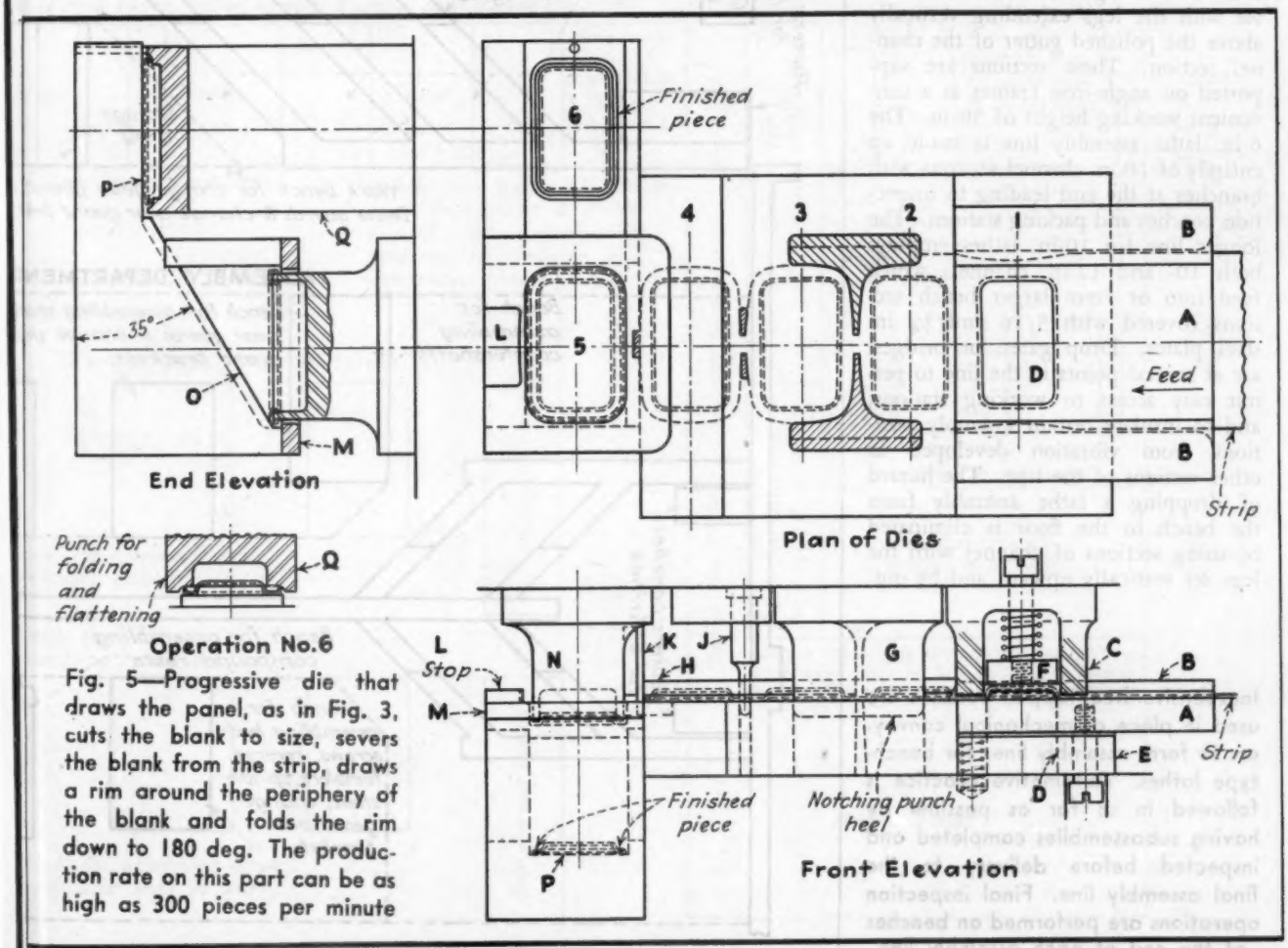


Fig. 5—Progressive die that draws the panel, as in Fig. 3, cuts the blank to size, severs the blank from the strip, draws a rim around the periphery of the blank and folds the rim down to 180 deg. The production rate on this part can be as high as 300 pieces per minute

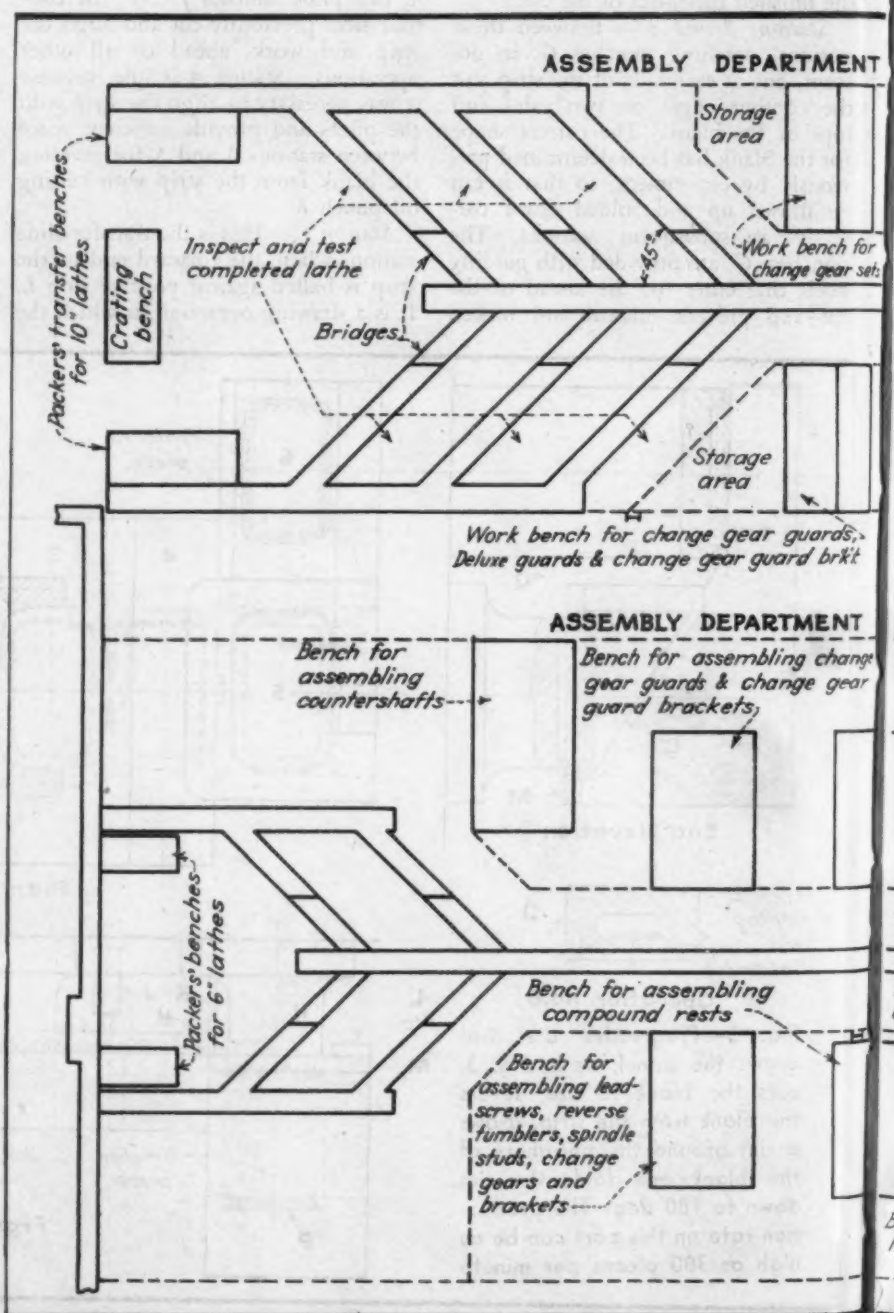
Auto Assembly Techniques Applied to Bench Lathes

BY J. G. COLLINS, SUPERINTENDENT, ATLAS PRESS COMPANY

AUTOMOBILE ASSEMBLY TECHNIQUES have been applied to the assembly of bench lathes by the Atlas Press Company without the expense of installing mechanical conveyors for moving the assemblies progressively along the line. Two assembly lines have been installed in the lathe department, one devoted exclusively to assembly of 6-in. bench lathes, and the other and longer line for the assembly of 10-in. bench lathes of several types. Each assembly line is a complete unit. Subassemblies are completed on work benches located near positions along the assembly lines where the subassemblies are mounted on lathes.

Basically, each lathe assembly line consists of lengths of steel channels set with the legs extending vertically above the polished gutter of the channel section. These sections are supported on angle-iron frames at a convenient working height of 30 in. The 6-in. lathe assembly line is made up entirely of 10-in. channel sections with branches at the end leading to inspection benches and packing stations. The longer line for 10-in. lathes employs both 10- and 12-in. channels which feed into or from larger bench sections covered with 3/16 and ¼ in. steel plates. Drop gates, or bridges, are at several points in the line to permit easy access to working stations, and to insulate certain assembly positions from vibration developed in other sections of the line. The hazard of dropping a lathe assembly from the bench to the floor is eliminated by using sections of channel with the legs set vertically upward and by outlining the wider steel-top benches with steel rail strips. Top surfaces of the work benches are kept polished and slightly oiled for moving a lathe assembly from one station to the next.

Along each line are storage areas where racks of parts are kept until needed on the final assembly line. Small parts, such as nuts, bolts and washers, needed at the various work


ASSEMBLY DEPARTMENT
Storage area
Packers' transfer benches for 10" lathes
Crating bench
Inspect and test completed lathe
45°
Work bench for change gear sets
Bridges
Storage area
Work bench for change gear guards, Deluxe guards & change gear guard brkt
ASSEMBLY DEPARTMENT
Bench for assembling countershafts
Bench for assembling change gear guards & change gear guard brackets
Packers' benches for 6" lathes
Bench for assembling compound rests
Bench for assembling lead-screws, reverse tumblers, spindle studs, change gears and brackets

Inexpensive steel-topped benches are used in place of mechanical conveyors to form assembly lines for bench-type lathes. Automotive practice is followed in so far as possible by having subassemblies completed and inspected before delivery to the final assembly line. Final inspection operations are performed on benches at the end of each assembly line

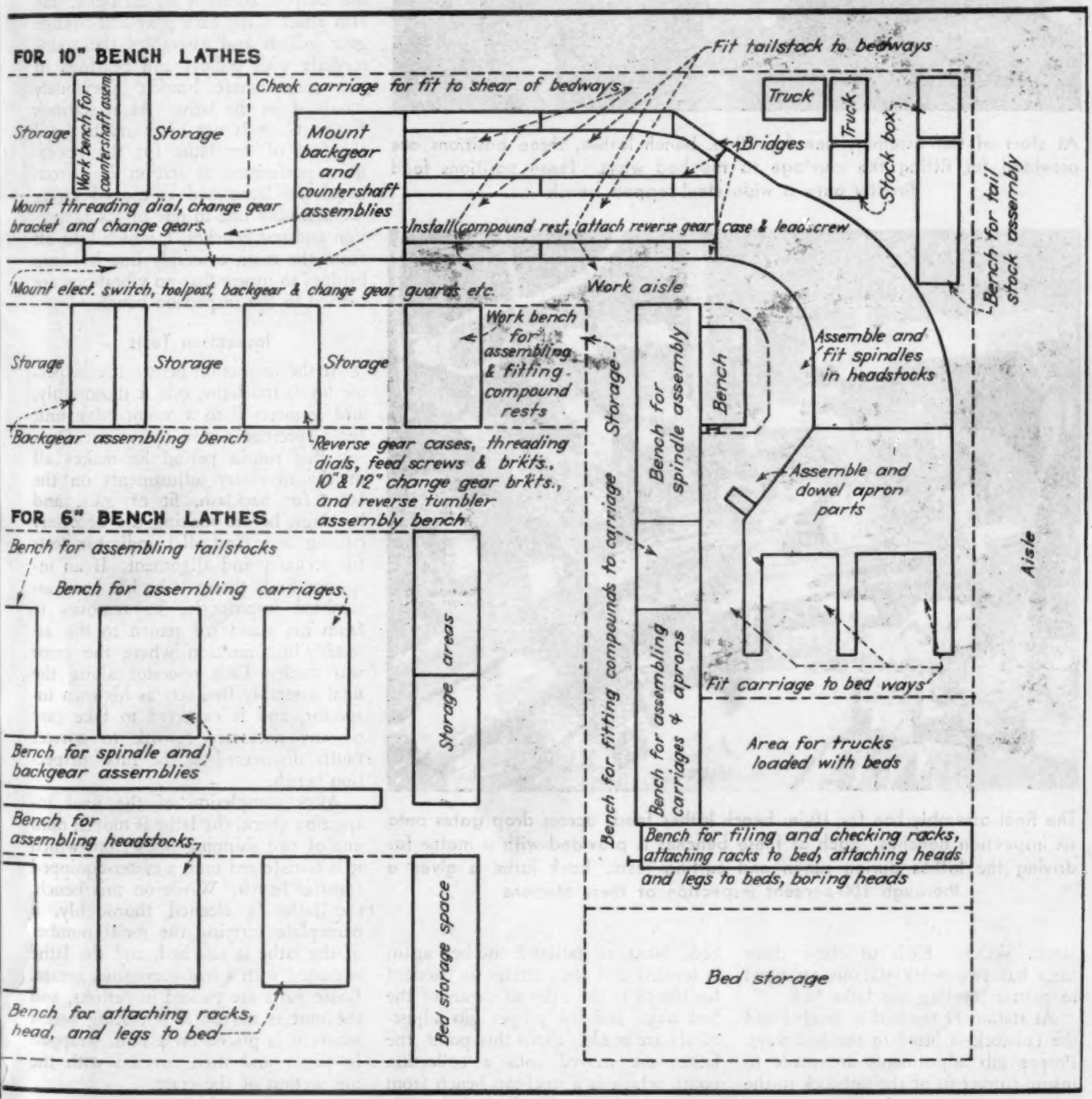
stations are kept in tote pans or trays placed on shelves directly under the line. Parts and subassemblies delivered to the final assembly lines are inspected and painted before shipment.

At the start of the large assembly line, there are three individual work stations *A*. At each station an operator levels a lathe bed, to which the headstock, legs and racks already have been assembled, and fits a carriage assembly to the bed ways. Like the lathe bed, the carriage assembly is completed at a separate work bench before delivery to this station. Before moving the lathe along the line, the operator at station *A* must get a full-

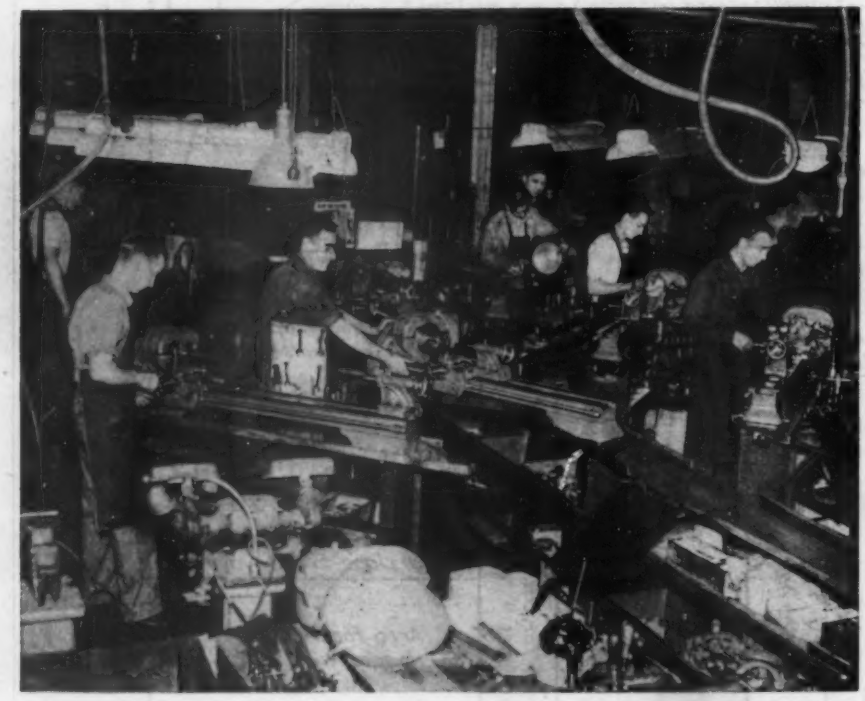
Expense of mechanical conveyors is eliminated in system adopted by the Atlas Press Company for assemblying bench-type lathes

seat bearing of the carriage upon the bed ways. He also adjusts the shims under the ways to a tolerance of 0.001 in. The three work stations *A* feed directly into a large table which forms a collection point on the line for the shorter operation at station *B*, where one man removes the carriages from the beds of the lathe assemblies and dowels the split-nut assembly, traverse assembly, power crossfeed mechanism, and other apron parts in each carriage. He remounts the carriages and moves the lathe beds along the bench to the next work station.

At station *C* one man assembles and fits spindles to the lathe headstocks and makes the proper bearing adjustments. Both Timken roller bearing and sleeve bearing type spindles are assembled at this station. From station *C*, the lathes are moved along the bench, around a curve, to a collection point from which the lathes are distributed onto three lines across drop bridges as shown in the accompanying


FOR 10" BENCH LATHES
Fit tailstock to bedways
Check carriage for fit to shear of bedways
Storage
Work bench for countershaft assem
Storage
Mount backgear and countershaft assemblies
Truck
Truck
Bridges
Stock box
Mount threading dial, change gear bracket and change gears
Install compound rest, attach reverse gear case & leadscrew
Bench for tail stock assembly
Mount elect. switch, toolpost, backgear & change gear guards etc.
Work aisle
Storage
Storage
Storage
Work bench for assembling & fitting compound rests
Bench for spindle assembly
Bench
Assemble and fit spindles in headstocks
Backgear assembling bench
Reverse gear cases, threading dials, feed screws & brkts., 10" & 12" change gear brkts., and reverse tumbler assembly bench
Storage
Assemble and dowel apron parts
FOR 6" BENCH LATHES
Bench for assembling tailstocks
Bench for assembling carriages
Storage areas
Storage
Aisle
Fit carriage to bed ways
Bench for fitting compounds to carriage
Bench for assembling carriages & aprons
Area for trucks loaded with beds
Bench for spindle and backgear assemblies
Bench for assembling headstocks
Bench for filing and checking racks, attaching racks to bed, attaching heads and legs to beds, boring heads
Bed storage space
Bed storage
Bench for attaching racks, head, and legs to bed

At start of the assembly line for 10-in. bench lathes, three positions are provided for fitting the carriage to the bed ways. These positions feed directly onto a wide steel-topped bench



The final assembly line for 10-in. bench lathes feeds across drop gates onto six inspection benches. Each of these benches is provided with a motor for driving the lathes during run-in and cutting tests. Each lathe is given a thorough 100-percent inspection at these stations

layout sketch. Each of these three lines has two work stations arranged to permit leveling the lathe bed.

At station *D* the bed is leveled and the tailstock is fitted to the bed ways. Proper gib adjustments are made to insure correct fit of the tailstock to the bed. Next, at station *E* the bed again is leveled and the carriage is checked for the fit to the sides or shears of the bed ways, and the proper gib adjustments are made. From this point, the lathes are moved into a collection point, which is a steel-top bench from which they are moved, when needed, into position for work at station *F*.

At station *F* one man installs the compound rest assembly on the carriage, making the necessary gib adjustments, and attaches the reverse gear case and leadscrew to the lathe bed. It is not necessary to level the bed for these operations.

At station *G* two men work as a team, one on each side of the assembly line, to attach the threading dial, change gear bracket and change gears for the feed, back gear subassembly and countershaft subassembly. Also, these men mark witness lines for the compound and the crossfeed dials. Next, at station *H*, one man attaches the electric switch assembly and mounts the toolpost assembly on the lathe. He also attaches the back gear and change gear guards and assembles the countershaft with pulleys and bearings in the countershaft bracket previously mounted on the lathe. As at stations *F* and *G*, it is not necessary to level the bed of the lathe for the operations performed at station *H*. From here, the lathe bed is moved along the assembly line to one of six inspection and test benches, *I*, which lead off from the main assembly line by drop bridges to insure that no vibrations are carried to the inspection bench.

Inspection Tests

At the inspection bench, the inspector levels the lathe, oils it thoroughly, and connects it to a motor-drive unit for a specified run-in operation. During this run-in period he makes all of the necessary adjustments on the lathe for backlash, fit of gibs, and bearings, before making the necessary cutting tests and dial indicator tests for accuracy and alignment. If an inspector finds that a lathe has been assembled improperly, he removes it from his stand for return to the assembly-line position where the error was made. Each operator along the final assembly line acts as his own inspector, and is expected to take care of any necessary rework to correct faults discovered at the final inspection bench.

After completion of the final inspection check, the lathe is moved onto one of two shipping lines from which it is transferred onto a caster-equipped transfer bench. While on this bench, the lathe is cleaned thoroughly, a nameplate carrying the serial number of the lathe is attached, and the lathe is coated with a rust-preventive grease. Loose parts are packed in cartons, and the unit is moved to a crating bench where it is placed on a skid, wrapped in paper and then covered with the top section of the crate.

THE FAR EAST

Frontier for American Enterprise

IN THE great tradition of America, our frontier lies to the West. But for a United States that stretches from the Atlantic to the Pacific, to Go West is to arrive in the Far East. The feet of literally millions of our young men are now set upon that route.

Accomplishment of their objective—the defeat of Japan—will not end our responsibilities to the Orient any more than the defeat of Germany will end our responsibilities to Europe. This time we mean to see the venture through.

The first sketch of a political program for enlisting the strength of nations of good will to enforce the peace was drawn at Dumbarton Oaks. That is a good start. But those who participated know how much work remains before the blueprint becomes a fully matured plan, the plan becomes a structure, and the structure takes life and effective being in the living imagination and will of the peoples of the world.

No political accord, however high its purpose, can endure for long if it depends upon the loyalty and support of populations embittered by hopeless poverty that is offered no promise of relief. The poisonous dust of mass despair makes inevitable an ultimate explosion, whether it be sparked by a torch supplied from without or by its own internally generated heat. Much of the Far East is sufficiently close to that position to pose a grave problem to the Western world. It is of particular importance that American business men and workers alike recognize the nature of their responsibility in the matter, for to them the great area of the East presents also an opportunity and a challenge.

☆ ☆ ☆

The Orient—stretching in a vast semicircle from Manchuria and Japan to India and Ceylon—is the home of more than a billion people, the world's greatest potential market. In its mountains are the earth's richest stores of tin and mica; its deposits of iron ore, coal, and manganese rival those of France, Russia, and the United States. Its rice paddies are the most productive in the world, its coconut and rubber plantations the largest, and its cotton production is of major volume.

And yet, this fabulous region—with its riches of manpower and raw materials—suffers from living standards at the lowest rung of the world scale. With as much as 85 per cent of the populations of this great area devoted to the production of farm products, starvation has been an endemic plague to countless millions of its inhabitants, and will remain so until they graduate from the crudely primitive methods of the crooked stick and the bamboo plow to the use of the implements of a modern world in both agriculture and industry.

The improvement of agricultural methods and the burgeoning of industrial development depends upon tools—a preponderance of simple tools, no doubt, at the beginning, for modernization of economic processes is a development that cannot be forced at a rate faster than the ideas upon which they depend can be developed. If we, in the United States, are to hope to supply a major portion of the implements upon which the salvation of the East depends, we must be prepared to export also the skills and technologies which will make their effective use possible.

The possibility of a world market for machinery and manufactured products is a challenge that American industry cannot afford to ignore. The United States will emerge from the war with almost half of the world's industrial capacity within its borders, with much more than half of the heavy industries. Drastic and painful readjustments are inevitable; but they can be mitigated to the extent that we can find outside markets for the products for which we have excess capacity.

We shall find ourselves, at war's end, in a singularly favored position to compete in any equipment markets which are open. It is not merely that we shall have the productive capacities crying for outlets. Aside from Germany and Japan, which for some time will not be in a position to compete, our two major industrial Allies, Great Britain and Russia, will face enormous tasks in providing for their own rehabilitation. Neither of them is likely to be in a position to export more capital than they absorb; and although Canada, Sweden, and Switzerland will be, the United States will stand alone as the one major creditor nation in the world. If the potential advantages of this position are managed with wisdom and imagination, they will enormously enhance our opportunities for supplying a great share of the capital goods demand of undeveloped areas.

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What is the dimension of the Far East's potential demand? What are some of the difficulties standing in the way of its being realized?

If needs were the only measuring stick, the Far Eastern market would provide a bottomless pit into which even the great stores of our exportable capacity could be poured with room to spare.

China, alone, with its teeming population of 450 millions, has spelled out needs in dimensions large enough to stir the imaginations of the equipment producers of the world.

Business Week (February 5, 1944) supplements Dr. Sun Yat-Sen's spacious first estimates of the requirements for a thorough-going industrialization program with figures provided by current Chinese planners—25,000 locomotives; 300,000 freight cars; 20,000 passenger coaches; 20,000,000 tons of steel; and 90,000 power driven machine tools for the first five years of reconstruction. An American manufacturer of farm equipment, who recently surveyed the agricultural requirements of China, estimates an ultimate Chinese market for 20,000,000 tractors.

India's drawing-board plans are equally expansive. According to the bold pattern drawn up by a group of Bombay industrialists—some of whom are due to visit the United States early in 1945—India, after the war, will require a capital investment of $2,000,000,000 a year over the next 15 years, of which $250,000,000 per year for the first seven years will be in the form of imported capital goods.

Included on the huge import order list of the Bombay executives are mining, roadbuilding and power station equipment, heavy locomotives, metallurgical plants, agricultural machinery, and a long list of machine tools.

There can be no question of the need of these countries for the industrial equipment—and for many items of manufactured goods—which we are so eminently in a position to supply. But realism requires that we measure this demand against the Far East's probable capacity in the relatively near future to absorb industrial goods.

A Chinese economist has estimated that China, in 1937, had a total industrial capital investment of about $1,000,000,000 in American values, or something like $2.50 per capita of population. In contrast, the American investment, in manufacturing facilities alone, is now more than $600 per capita.

What it could mean in terms of capital goods requirements if China alone carries out this dream of modernizing, not to the utopian level of the United States but to the present modest level of the less developed Soviet Union, is typified by measuring just three lines: 500,000 tons of steel a

year, for five years, to add 12,500 miles to the railroad system; 2,187,500 motor vehicles; 3,300,000 telephones.

But it is one thing to cite mountainous figures demonstrating needs. It is another, and far less optimistic exercise, to find assurance that practical opportunities for satisfying such needs can be made to materialize. Let us face some of the major difficulties and see if they are insurmountable.

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The first hurdle to be cleared is the question of whether or not we want to promote the industrialization of the Far East. The wisdom of doing so has been vigorously challenged. The negative argument, on the economic side, generally runs thus: If we provide industrial equipment to backward economic areas, we deprive ourselves of the greater long-run opportunity of selling them manufactured articles which our aid has enabled them to produce for themselves.

It is only fair to say that such a thing might happen—that it has happened in isolated instances in the past. But the overwhelming weight of economic history demonstrates that the broader attitude is also the profitable one.

The United States itself is the living refutation of the fear which now cramps the outlook of many of its own citizens.

From 1790 until 1850 the foreign trade of our new fledged Nation had many of the characteristics which pertain to the trades of China and India today. We imported manufactures and we exported raw materials, agricultural products, and newly mined gold. Our imports exceeded exports, the difference being made up partly by payments to us for shipping services and partly by industrial development loans. It is relevant to inquire how the trade of the lenders was affected by this policy of supplying us with industrial capital and machinery.

From 1850 through 1939 the pattern of America's foreign trade changed. Slowly at first, and then at accelerated pace, our import ledger showed a percentage decline in manufactured goods and a percentage rise in raw materials to feed our expanding industrial facilities. But while finished manufactures declined percentagewise in our import budget, so great was the increase in our total foreign trade operations in the century from 1830 to 1930 that our imports of manufactured goods increased more than twentyfold, and they more than doubled between 1900 and 1939.

Clearly industrial Europe gained rather than suffered from the industrialization of the United States, and it is equally clear that we, in turn, shall benefit from the industrialization of the world's undeveloped territories. Further evidence is provided by Canada which, with its high industrial development but only 12 million people, buys from us each year almost as much as the relatively unindustrialized 130 million people south of the Rio Grande.

If it be granted, as I believe it must, that the development of Far Eastern countries will be to our advantage as well as theirs, the second question that we should face is the speed with which it can be accomplished. Is there genuine promise in the proximate future of opportunities for American enterprise of the magnitude set forth in the estimates quoted above?

In all fairness, I am forced to state my conviction that the road is longer than is indicated by Chinese and Indian leaders. It is natural, and far from censurable, that their eyes should be focussed upon the urgency of national needs, rather than upon obstacles in the way of their fulfillment.

On the other hand, it is possible that our own long process of industrialization may lead us to conclusions of undue conservatism. Ideas, once they break the crust of resistance are the most contagious of bacteria, and the tempo of their infiltration seems to increase by geometrical progression in a world of swift communication.

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In an interesting recent study of The International Labor Office, it is suggested that the general economic level of the rest of Asia outside Japan in the late 1930's was not dissimilar to that of Japan in 1900. Between 1900 and 1936, Japan increased its total capital investment more than threefold devoting between 10 and 17 per cent of its annual income to capital outlays. A comparable tempo of development for China, India, and other Asiatic areas would result in a capital expansion that would dwarf to insignificance the most optimistic blueprints that have been put forth to date. I am not suggesting this as a likely possibility, but rather as a caution lest we, in the name of hard-headed realism, underestimate Asiatic potentials as much as their own nationals exaggerate them.

Finally, in appraising the outlook for American enterprise in Far Eastern markets, we collide, head-on, with the problem of how we are to be paid. Here, hard-headedness can be only a virtue, for the lack of it will breed inevitable disaster for the Asiatics as well as for us.

In the last analysis, the dimension of the American market in the Far Eastern countries will be determined by the dollar exchange at their command, obtained through the products, goods, and services which they are able to provide to us, with due allowance for multilateral trade arrangements. It is true that the balance temporarily can be distorted through the extension of developmental loans. There is little question but that such loans will be in order after the war, and if they are wisely made, for productive projects that eventually will increase the exporting capacities of the countries to which they are extended, they can be thoroughly justified. But the best loans provide only a temporary expedient. In the long run, the balance of current payments must be restored with sufficient margin to provide interest payments and finally amortization of principal.

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How, then, are we to attack the problem of increasing our imports from the Orient?

In 1937, the total exports of the Far East amounted to something over $5,000,000,000—a little less than $1,500,000,000 in foodstuffs, a little more than $2,500,000,000 in raw and partly manufactured materials, and better than $1,000,000,000 of manufactured articles. Of this total, the United States purchased only about 20 per cent—approximately 10 per cent each of the foodstuffs and manufactures, and 30 per cent of the materials.

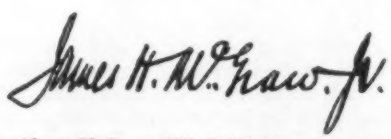
Despite changes in our technologies which will probably reduce our future takings of such important items as rubber and silk, the achievement of a high level of economic activity in this country after the war will provide a basis for increasing our Eastern imports, but only if it is an accepted part of our national policy to do so.

This means an alert and aggressive exploration of two-way trade possibilities on the part of both American business and our governmental agencies. It cannot be done by either alone.

The war has dislocated many of the trade patterns that prevailed in the past. The East is hungry for the type of products which we, uniquely, are situated to supply, but it will make its bargains with those who will not only fill its needs but will also provide outlets for its produce. Even the prewar magnitude of the exports from this area provides ample margin for the most meticulous and imaginative shopping of Eastern markets with the aim of increasing the modest share of our prewar purchases. And a farsighted program of development loans can greatly increase the capacity of these countries to produce what we want.

In general, we can trust American enterprise to explore rigorously all likely export opportunities. But the equally vigorous investigation of import possibilities will require a break from past traditions on the part of American business and American government.

Both East and West must learn to think in new patterns for the successful opening of a new frontier.



President McGraw-Hill Publishing Co., Inc.

Tabulated Data Speeds Balancing of Compressor Rotors

BY MILTON HOEPPNER, MASTER MECHANIC, B-W SUPERCHARGERS, INC.

Dynamic balancing is achieved by cutting away metal from one or more ribs inside rotor lobes to predetermined specifications

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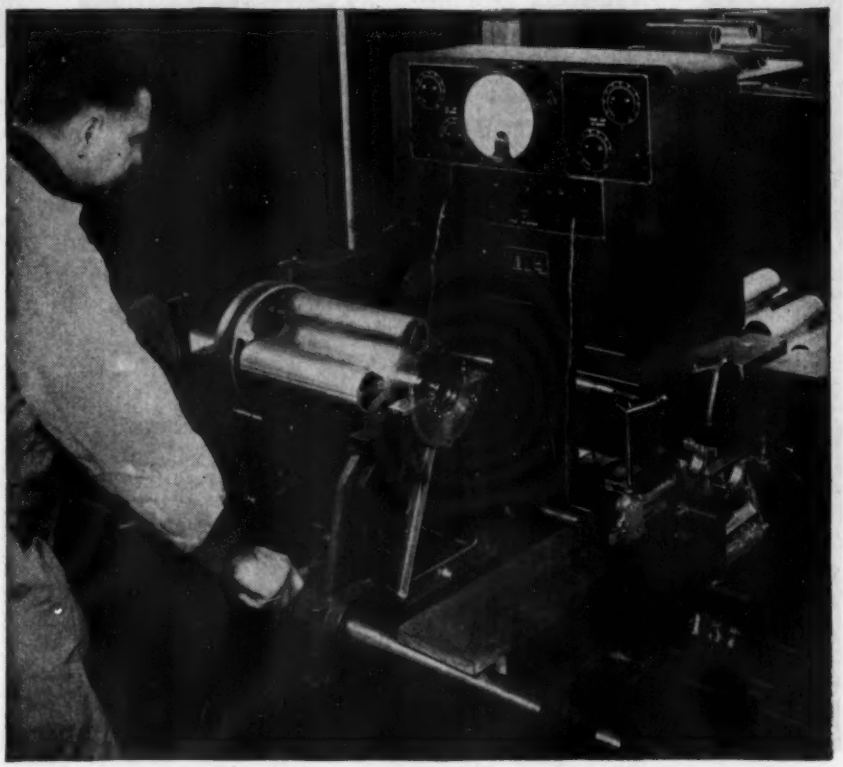
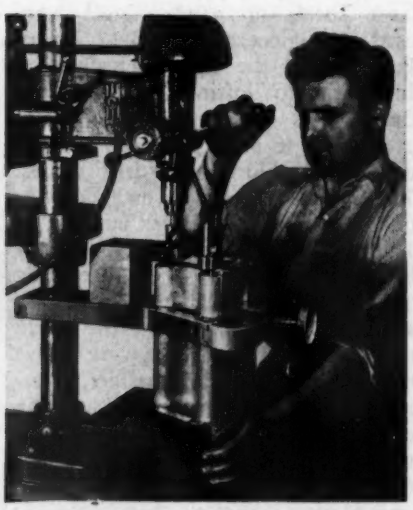
Because of the high speeds at which they operate, all rotors for the positive-displacement type air compressors, blowers and superchargers manufactured by B-W Superchargers, Inc., Division of Borg-Warner Corporation, are dynamically balanced to within 0.10 oz.-in. on a Dynetric electronic balancing machine. Once the location and the amount of unbalance is determined, the rotors are brought into balance by cutting away a portion of the rib inside one or more of the rotor lobes.

To facilitate this operation, the amount of metal to be removed and the rib or ribs from which it is to be taken has been calculated for each condition of unbalance on each standard size of rotor. Thus, when the operator has determined the amount and location of unbalance for a given rotor, he merely refers to a sheet of tabulated data to determine which rib should be cut away, and how deep a cut should be taken with a standard-diameter flat-bottom drill.

The drilling operation is performed in a bench-type Walker-Turner drill press, with the rotor held vertically in a special fixture which incorporates a guide arm and drill bushing to guide the flat-bottom drill during the cutting operation. As shown in an accompanying illustration, this fixture has a baseplate with guide bars against which one end of the rotor is placed. The upper end of the rotor is supported by a yoke frame having a clamp bar which closes the open end of the yoke when the rotor is in position. An air hose is provided so that chips can be blown out of the fixture before a rotor is positioned for drilling.



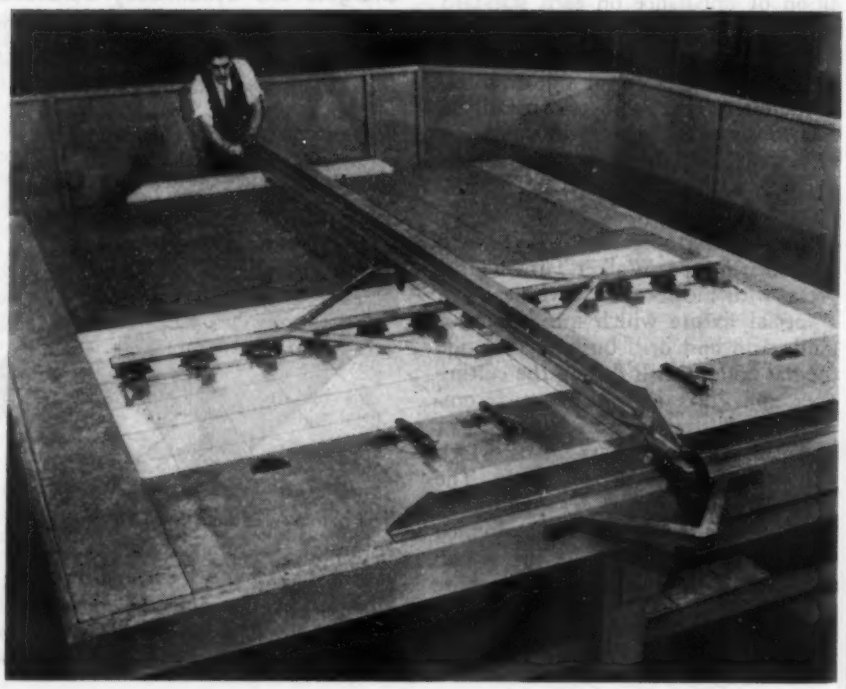
All rotors for positive-displacement type compressors made by B-W Superchargers are dynamically balanced to within 0.10 oz.-in. in a Dynetric machine. Tabulated data helps the operator determine the amount of metal to be removed in order to correct any condition of unbalance



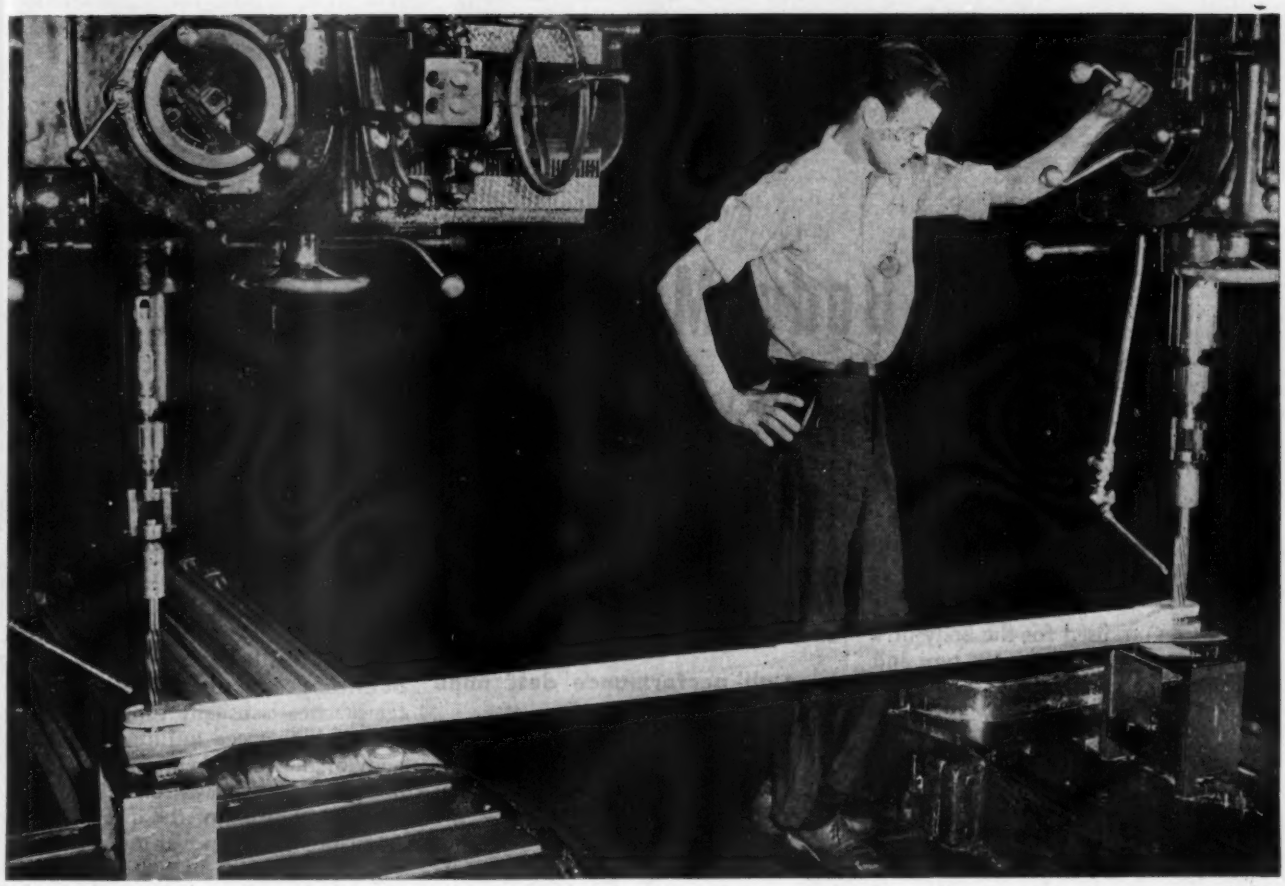
To bring a three-lobe compressor rotor into dynamic balance, above, metal is removed from one or more ribs inside the ends of the lobes as indicated. A simple clamping fixture and drill guide on the drill press, right, simplifies metal removal to balance rotor dynamically

SHOP SHOTS

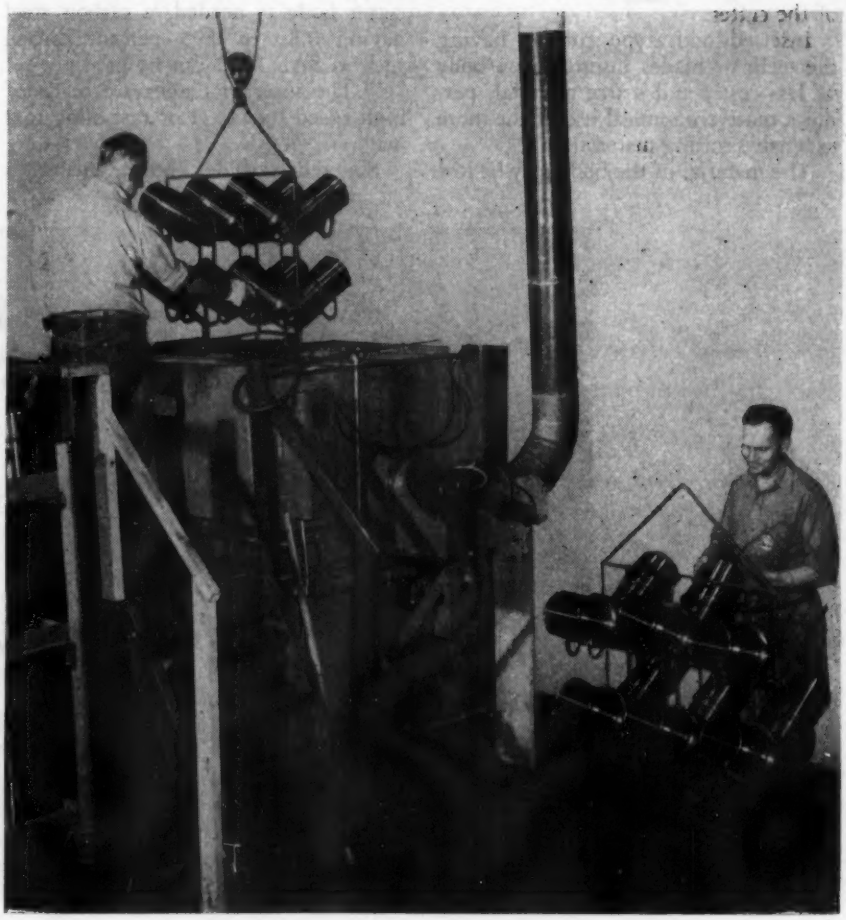
Tank engine exhaust manifolds, ordinarily cast, are fabricated by arc welding on this homemade rotating positioner. Made of pressed stainless steel the manifolds are turned out by four operators at a rate of 66 in less than seven hours. Two longitudinal half-sections are welded together to form the body of the manifold, and the six flanges and one ring are welded to them. Ford Motor Company.



Master layouts to exact size on large sheets of painted steel were used in engineering the B-17 Flying Fortress and the B-29 Superfortress. In addition to "lofting" the ship itself, the layouts are reproduced photographically to make templets for jigs, dies, router blocks and drill guides. The accuracy of the layouts depends on grid or reference lines laid out in 10-in. squares. Scribing these lines by hand was a tedious job, requiring 5,600 hours on one model alone. To avoid this laborious task, the "grid machine" was developed having twelve tungsten-carbide scribing edges, a carriage, a guide beam and a squaring device mounted on a table. When the rubber-tired carriage is moved across the layout sheet by a crank, lines are scribed more accurately than is possible by hand and in a small fraction of the former time. Boeing Aircraft Co.



Two radial drill presses instead of one are used to drill spar chords for B-26 Marauders. The second press was called for by the 10-ft. length between holes of the part being drilled. Since the dimensional range of a single press was just about six feet, this job would have required a separate set-up for each hole on a single press. By using two properly spaced presses simultaneously, moving of the job between holes was eliminated, resulting not only in saving of man-hours, but actually of machine hours as well. Glenn L. Martin Co.



Welded racks of steel rods have speeded up the degreasing of finished aircraft engine cylinder barrels. Originally, these barrels were dipped in the degreasing tanks, one at a time, while suspended on wooden sticks. Frequently these wooden sticks would load with steel chips and grit which would scratch the highly polished bores of the cylinder barrels. Now, twelve cylinders can be cleaned faster and cheaper, without danger of damage to the bores. Nash-Kelvinator Corp.

Milling Cutters and How to Use Them

Cutter Body Materials Selected With an Eye to Application

BY M. MARTELLOTTI, RESEARCH ENGINEER, CINCINNATI MILLING MACHINE CO.

THE MATERIAL used for the body of a milling cutter depends on the type and design of the cutter.

Solid-type cutters are now generally made of high-speed tool steel. This practice does not always permit an economical use of tool steel, since a large amount of material must be removed by machining in order to produce the desired form, and only a small fraction of the cutting material is actually used for cutting throughout the useful life of the cutter.

Inserted-tooth type cutters, having the teeth or blades inserted in a body of less costly and scarce material, permit a more economical use of the more expensive cutting material.

The material of the body may be low carbon steel or high grade alloy steel, heat-treated to obtain the necessary strength and hardness. When a hard cutter body is needed, a carbon steel having 0.80 to 0.95 percent carbon such as SAE 1095 can be used.

3—Economy of materials and over-all performance determine whether a cutter should be of the solid or inserted-tooth type

The inserted blades are made of high-speed tool steel or cast alloy tool material.

Sintered carbide cutting materials are generally used in the form of small tips brazed either to the inserted blades or directly to the cutter body. The latter practice is usually followed in the case of high-speed milling cutters, the body of the cutter being made of steel or high strength cast iron. Fig. 5.

A modification of the inserted-tooth type cutter is the special milling cutter, Fig. 6, in which the sintered carbide tips are brazed to lathe tool shanks. The clamps are self-contained, consisting of two bushings, one of which is tapped for the threaded end of the clamping screw. Binding together the two bushings, clamps the tool shanks firmly.

This design eliminates the difficulty which would result if the threads were

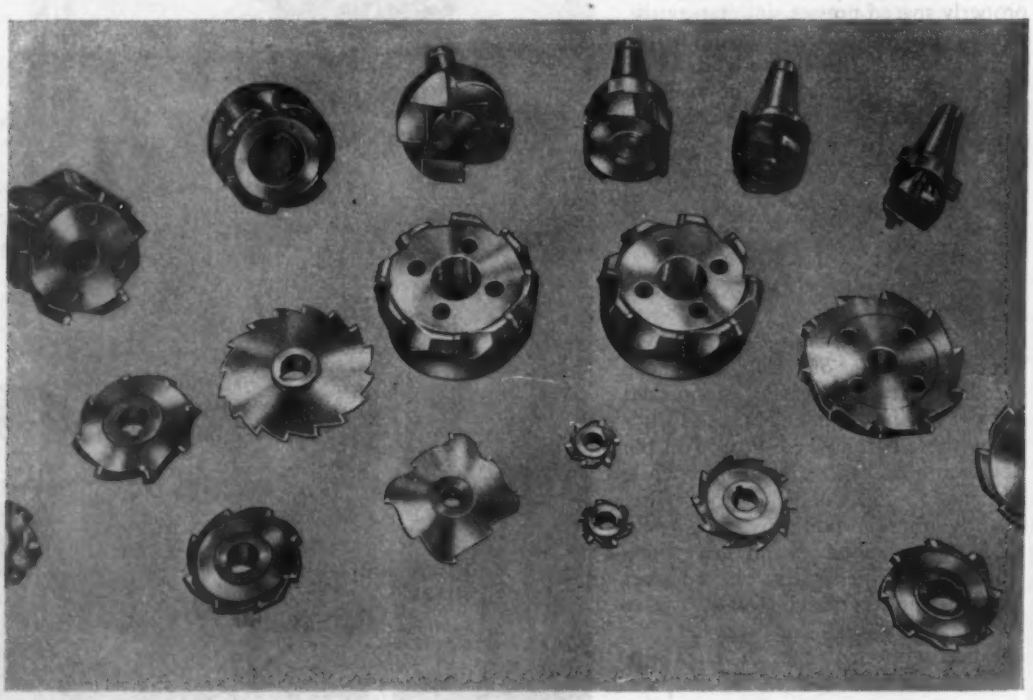


Fig. 5—Typical cutters for high-speed milling show a wide variety in design

located in the body of the cutter. This cutter is ground for machining alloy steel and has the commonly used combination of 10-deg. negative axial rake and 10-deg. negative radial rake with a 30-deg. corner angle.

Three Cutter Body Materials

Materials which have been found satisfactory for use when tipping with sintered carbide are the following:

1. Low alloy steel having 0.40 to 0.60 percent carbon.
2. Plain carbon steels 0.40 to 0.90 percent carbon.
3. High strength cast iron.

An advantage in using cast iron lies in its ease of manufacture. Some improvement in tool life may also be obtained due to absorption of vibration because of its high internal damping.

In order to conserve cutting material, tipping is resorted to in the case of cast tool alloy material, and also occasionally with high-speed steel. In tipping with high-speed steel tips, the body material used is usually low carbon steel of 0.20 to 0.40 percent carbon.

Methods of Brazing Tips

Tips of cutting materials can be attached by several methods:

A. *Low temperature brazing or silver soldering* is generally preferred when brazing tips to a cutter body since the equipment needed, an oxy-acetylene torch, is usually available in the average shop. Where a considerable number of tips have to be brazed, however, induction heating is now rapidly replacing the torch method.

Brazing sintered carbide and cast tool tips is done by interposing a silver brazing alloy shim of 0.003 to 0.008 in. thickness with a melting point below 1600 F. between the cutter body and the tip of cutting material. In some cases a recess is machined to accommodate the tip, Fig. 7.

In either case, the surfaces to be joined must be smooth and clean. To remove dirt and grease, these surfaces may be cleaned with a good solvent such as carbon tetrachloride. They are then coated with a commercially prepared flux which should be fluid and active at the brazing temperature, and capable of dissolving the oxides produced.

Where the torch method is used, the oxy-acetylene flame should be adjusted to a green tip color (non-oxidizing) and should be directed on the body of the cutter under the tip and not on the tip. As the silver brazing alloy melts, the flame is withdrawn, and the tip is pressed firmly into place until the alloy solidifies. The tool should never be quenched.

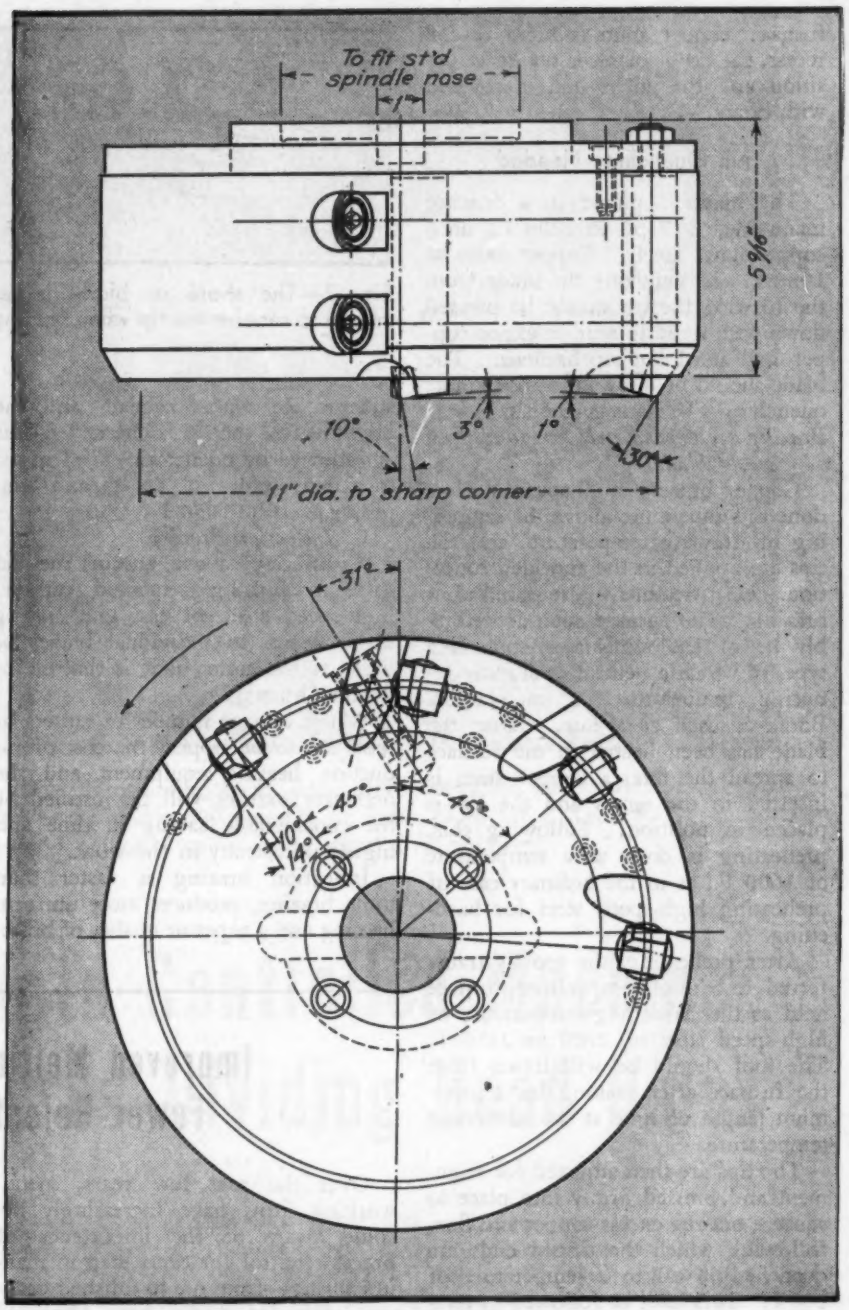


Fig. 6—This inserted tooth cutter uses standard carbide-tipped lathe tools

Brazing high-speed steel tips

The same general procedure applies in brazing tips of hardened high-speed steel. In this case, however, the brazing temperature should not exceed 1100 F., which is the drawing temperature of the steel and a silver alloy with a melting point less than 1100 F. should be used. The flame should be withdrawn when the tip becomes heated to a barely visible red. After the braze is set, the tool is immersed in oil, followed by cooling in air.

B. *High-temperature brazing* is used when brazing a large number of tools such as lathe tools and blades for inserted tooth milling cutters. It is normally done in furnaces preferably of the atmosphere-controlled type in which a neutral or slightly reducing atmosphere is maintained. The brazing material is usually copper in the form of shims 0.003 to 0.005 in. in thickness. Borax is used as a flux.

Brazing carbide and cast tool tips on milling cutter blades

After cleaning the recessed surfaces, they are covered with borax and the blade is preheated in a furnace to about 1600 F. to obtain a borax covering over the surfaces to be joined. Then the blades are removed from the

furnace, copper shim is fitted to the recess, the tip or blank is placed in position and the entire end is covered with borax.

No Quenching Needed

The blade is placed in a furnace maintained at 2150 to 2200 F., until copper flows freely. Copper melts at 1980 F. In removing the blade from the furnace, the tip should be pressed down with a rod to remove excess copper and until copper hardens. The blade should be allowed to cool in air; quenching will damage the tip.

Brazing high-speed steel tips to milling cutter blades

Copper brazing high-speed steel is done at temperature above the tempering or drawing temperature, and the tips are applied in the annealed condition. Heat-treatment is required after brazing. The furnace should preferably be of the atmosphere-controlled type, in which a neutral or slightly reducing temperature is maintained. Borax is used as a flux. After the blade has been heated in the furnace to spread the flux, a copper shim is inserted in the recess and the tip is placed in position. Following this, preheating is done at a temperature of 1600 F., as in the ordinary case of preheating high-speed steel for hardening.

After preheating, the tool is transferred to a high-temperature furnace held at the hardening temperature of high-speed steel of 2200 to 2350 F. The tool should be withdrawn from the furnace after soaking for a minimum length of time at the hardening temperature.

The tips are then adjusted for alignment and pressed firmly into place to squeeze out the excess copper and flux, following which the tipped ends are quenched in oil to a temperature of 200 F. This must be followed by tempering at 1000 to 1050 F.

Iron-Alloy Cement Also Used

High-speed steel tips can also be brazed with iron-alloy cement. The procedure is the same as that followed in copper brazing, with this difference: the surfaces to be joined are wetted with a solution of copper sulphate and sulphuric acid in the proportion of three ounces of copper sulphate and ten drops of sulphuric acid to one pint of water. The surfaces are then sprinkled with the iron-alloy cement and the tip is pressed in position and laid aside until sufficiently firm to permit handling. After preheating to 1600 F. and subsequent heating to 2200-2350 F., the tool is withdrawn from the furnace; pressure is applied to

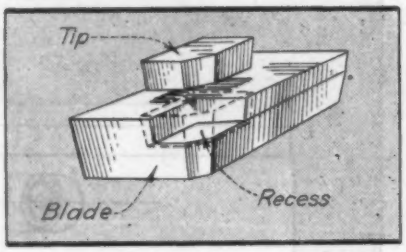


Fig. 7—The shank or blade is recessed to receive the tip when brazing

squeeze out excess cement, and the alignment of the tip is checked. This is followed by quenching in oil or air to a temperature of 200 F. and tempering to 1000-1050 F.

C. *Induction Brazing*

As indicated above, another method used in brazing cemented carbide, high-speed steel, or cast tool cutting material tips to individual blades or direct to the cutter body is that of induction brazing.

Where a large number of cutters or tools are to be tipped, the cost of induction heating equipment and the necessary fixtures will be justified by the considerable saving in time and higher uniformity in the work.

Induction brazing is faster than torch brazing, produces more uniform heating and a superior quality of braze, and in the case of carbide tips, reduces the likelihood of heat cracks on the tip, and can be performed by less skilled operators. However, it requires special fixtures for holding the cutter and the heating coils in the proper position.

Types of Induction Heaters

The most common types of induction heating units are the spark-gap oscillator, generating frequencies between 100,000 and 300,000 cycles, and the vacuum tube oscillator, which generates frequencies from 1,000 to 1,000,000 or more cycles.

The greatest advantage of induction heating lies in the possibility of producing a localized heat controllable within close limits of temperature. In many cases, these conditions cannot be satisfied when using the torch or furnace heating methods.

In induction heating, the rate of penetration of the heat can be controlled by the frequency of the current. The higher the frequency, the closer is the heating to the surface of the work. By varying the frequency, therefore, it is possible to obtain a localized heating effect.

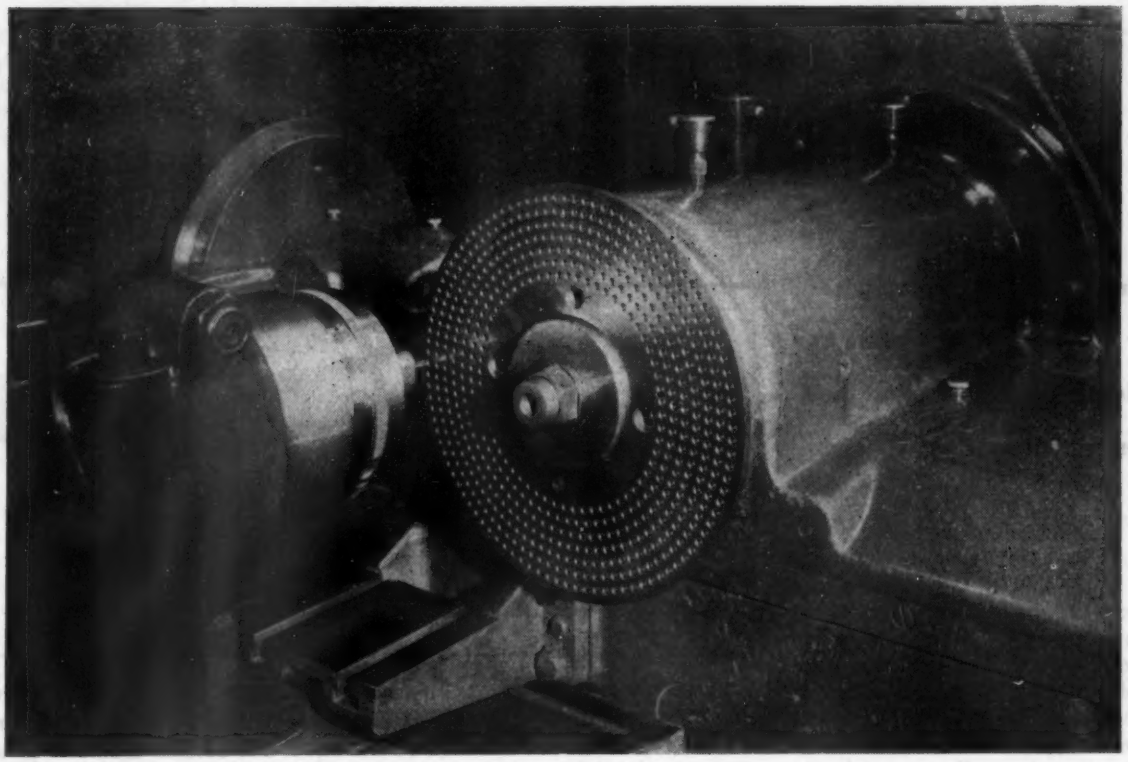
Part 4 of Mr. Martellotti's series on milling cutters will appear in an early number.

Improved Melting Practice Means Fewer Rejects in Machining

Over the past few years, metalworking firms have increasingly become aware of the importance of process control for every step in manufacturing—from ore to finished product. Detailed studies have often led to important improvements in quality of the product, simplification of manufacturing procedures and elimination of operations previously thought necessary. The result has been a much smaller percentage of scrap loss, better deliveries and lower costs.

In the field of precision castings, many of them of alloy or stainless steels, significant reductions in scrap have been obtained by developments in melting practice. Prior to the development of a certain electric melting furnace, it was said that scrap losses ran as high as 50 percent. But with improved melting practice, rejects are now under 20 percent. Good foundry practice is also important, because it can further reduce rejects. However, the most important gain is realized by proper control over melting practice.

What does this mean? First of all, rejects in rough machining are reduced, labor is saved, schedules are better maintained. Second, with cleaner metal, complex items can be finish-machined with more certainty that close tolerances and fine-grade finishes will be achieved without trouble from inclusions. Third, the precision casting processes now in use can produce items that are sound and require little or no machining. Very often, only 0.030-in. stock allowance need be provided on surfaces to be finished by grinding. Fourth, new bonding or cladding processes are facilitated—for example, the bonding of aluminum to steel. In other words, by keeping abreast of how melting and foundry practice can be and is being improved and controlled, the fabricator of metal products not only can effect savings upon his own operations but also can broaden his choice raw material.



An Ex-Cell-O high-speed precision boring head, accurately controlled by a series of master plates, drills and bores nearly 600 holes in an index plate for a Kearney & Trecker hypoid universal spiral bevel gear dividing head

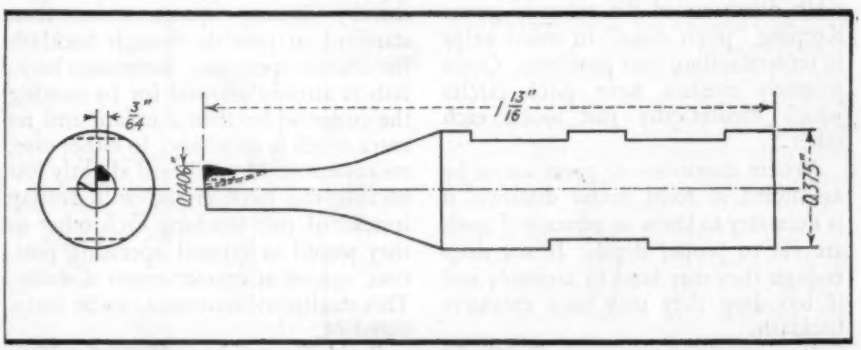
Master Plate Controlled Machine Speedily Bores Dividing Head Holes

PRECISION of index plate boring has been assured and production materially speeded by a special machine Kearney & Trecker Corporation built for that purpose.

The machine has an Ex-Cell-O high-speed precision boring head which is used both in drilling—at 2,500 r.p.m. —and in boring—at 5,200 r.p.m.,—the index plate for a hypoid universal spiral bevel gear dividing head.

A series of master plates at the back of the machine index for drilling and boring two index plates at one time. Drilling and boring are separate operations, with a 0.128 in. high-speed drill used for the first operation. Feed is at the rate of 3 in. per min. and approximately 15,000 holes are drilled before the drill requires grinding.

Boring the 0.1406-in. holes in the index plate is done with a single-point, carbide-tipped tool with a ⅛-in. shank, as illustrated. Each plate is of close-grained cast iron of about 200 Brinell and has approximately 600 holes arranged in seven separate rows. On the completion of the last hole in each row, the machine stops automatically and the operator moves a lever which brings the indexing finger over to the next row of holes in the master plate. This requires so little time that the operator can easily run two machines. The 105 minutes cycle produces two index plates ready for use.

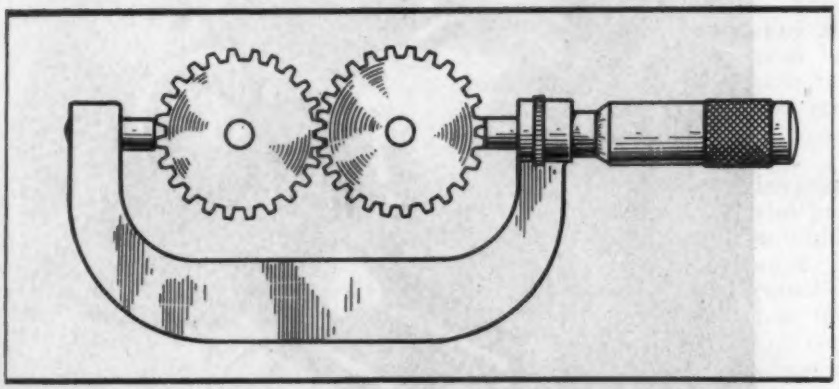


A carbide-tipped, single point tool bores the holes in the close-grained cast iron dividing head. Tool shank is 6190 S A E spring temper steel

Fine-Pitch Spur Gears Checked by Simple Methods

Gear checking often requires that several measurements be made to be certain that one essential dimension is right

BY CHARLES BULLEN



This method of measurement will show if gear teeth are too shallow. The dimension measured will equal one outside diameter plus one pitch diameter

IN CHECKING fine-pitch spur gears, the measurement of pitch diameter, tooth thickness and tooth depth are good examples of the composite nature of gear measurements. The correctness of any one being a measure of correctness of the other two. For example, to check thickness of a tooth on the pitch line with a gear vernier, it is necessary to first check the outside diameter. Any variation from the correct outside diameter may be divided by two and added to or subtracted from the addendum setting on the vernier.

Since pitch diameter cannot be measured directly, it is often misunderstood, so an explanation may be in order.

Assume two gears are mounted on shafts and meshed together, one 2 in. and the other 4 in. pitch diameter. The small gear would run at twice the speed but have half as many teeth as the large. If only a light load were to be transmitted, the teeth could be dispensed with and plain disks used, contacting at their outer edges under light pressure. To maintain the same speed ratio of 2 to 1 at the same shaft center distance, the disks would have diameters of 2 and 4 in., the same as the pitch diameters of the assumed gears. Keeping "pitch disks" in mind helps in understanding gear problems. Gears properly meshed have pitch circles which theoretically just touch each other.

Where quantities of gears are to be assembled at fixed center distance, it is necessary to know in advance if teeth are cut to proper depth. If not deep enough they may bind in assembly and if too deep they may have excessive backlash.

It is usual to measure indirectly by checking tooth thickness on the pitch line with a gear vernier, but above a certain pitch the tooth spaces are too small to admit the vernier. In cases of this kind, and when no gear measuring wires are available, a simple and fairly accurate check can be made as follows:

Check the outside diameters of a pair of gears for size and concentricity with bore, and any variation be taken into account. The gears should be meshed together and a measurement taken over the outside diameters. This measurement M_1 should be theoretically equal to one outside diameter plus one pitch diameter, or the sum of two pitch diameters plus twice the addendum. It will show at once if the teeth are not deep enough.

Tooth Cut Deeper

Actually, unless the drawing places a limit on the depth, it is usual practice to cut the tooth somewhat deeper, thereby leaving spaces wider than standard to provide enough backlash for smooth operation. Sometimes backlash is already allowed for by making the cutter wider than standard and no extra depth is necessary. In either case, measurement M_1 will read slightly less because the pitch circles will overlap instead of just touching each other as they would in normal operating position, spaced at correct center distance. This smaller measurement can be designated M_2.

Backlash can be calculated. It is equal to $M_1—M_2$ times twice the tangent of pressure angle.

Example: If $M_1—M_2=0.004$ in. and the pressure angle is 14½ deg.

$$\text{Backlash}=0.004 \text{ in.} \times 2 \times 0.258 = 0.002 \text{ in.}$$

Since this pressure angle is the one most often used, it will be convenient and close enough to remember that backlash is equal to one-half the overlap.

Mating gears of different diameters can be checked in this same manner, the measurement rules being the same regardless of gear diameters involved.

Large quantities of fine pitch gears have been checked simply by holding one against the other by hand and the following conditions revealed:

1. Teeth hit bottom of mating tooth spaces.
2. A gear could be twisted from side to side out of plane of the mating gear. A closer check showed:
3. Width of space and pitch diameter correct when measured with wires.
4. Thickness of tooth on pitch line correct.

The first two conditions showed clearly that the tooth depth was shallow. These combined with the third and fourth indicated the possibility of an inaccurate tooth form.

Subsequent investigation showed that gear cutting machines were out of adjustment. It was also apparent that the machine operator had ignored the dial reading which indicated depth to which the cutter would normally be sunk. Measured with pins, the pitch diam-

eter showed up correctly, but if standard depth had been maintained in cutting, then the pitch diameter would have been undersize as would the tooth thickness.

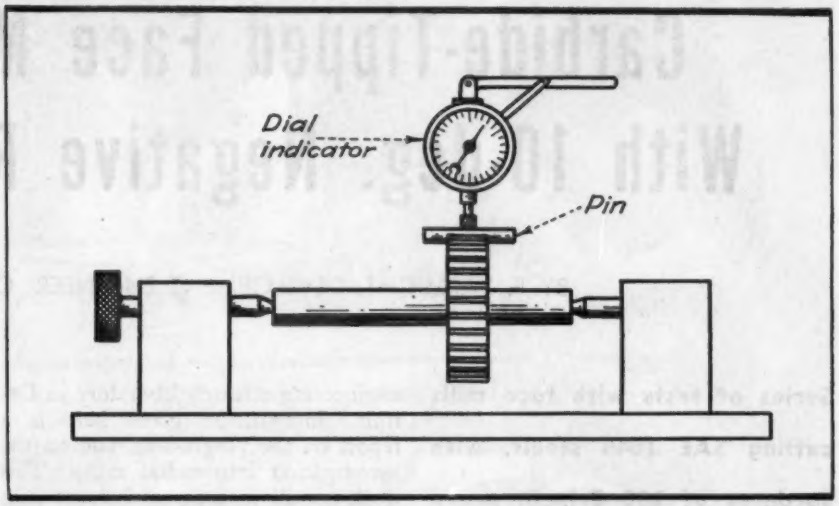
When gears are assembled at fixed center distances it is necessary to check to be sure that they do not mesh too tightly and it is also important to find whether they will bind, especially if backlash is held to a minimum. This entails inspection for "pitch line runout." Permissible runout is usually given as "total indicator reading." When the term "eccentricity" is used, it should be clearly understood that this is one-half the runout or total indicator reading. If a gear is perfectly round and true, but the bore is not concentric with it, then an eccentric condition exists. The amount of eccentricity is equal to the distance from the center line of the gear circle to the center line of the bore circle. Indicator readings on the gear would be twice this distance.

In the absence of a proper runout testing fixture, simple equipment usually available may be used as follows:

Press gears to be checked lightly on a true running mandrel and support on an inspection test center or between V-blocks. One V-block may be used with the mandrel clamped in. The gear will be left free to revolve, but without shake or vibration on the mandrel. If a regular lathe mandrel is used, it can be adjusted up or down to take care of any small variation in the bores.

Measure With Drill Rod

If gear or thread measuring wires are not available, a piece of drill rod should be selected of such diameter that when laid in a tooth space it will touch just below the edges. The drill rod should be hardened and polished, and may be held in place with rubber bands.



With this set-up the eccentricity of a gear can be checked. To speed such checking, the pin should be attached to the dial indicator anvil

The lever, or extended, type of indicator is probably the most convenient, although any type can be used. As previously stated, practically any measurement made on gear teeth is a composite one, so eccentricity may be combined with tooth spacing variation. However, if this test is made as described, that is close to the top of the teeth, variation, if any, will be almost entirely due to eccentricity. This will show up as gradually increasing indicator readings up to a point diametrically opposite from the lowest reading. Any abrupt change in readings would be due to extreme spacing variation or change in tooth form. The latter cannot be checked without a projector or special equipment not always available, even in gear shops.

Circular pitch variation can be detected though not actually measured by the pin method. The pin should be much smaller than that used for checking eccentricity and of such diameter that it will make contact near the pitch line or slightly below, but not small enough to touch the bottom of the tooth space.

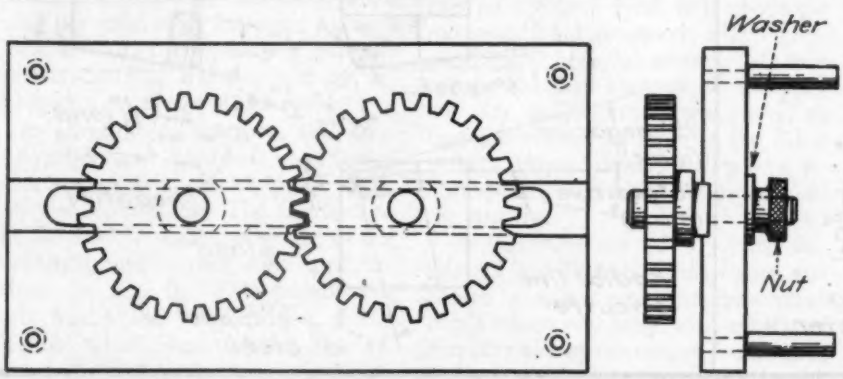
Results may be compared with those taken from a reference gear which is acceptable so far as circular pitch is concerned. Such a gear may have been checked under running conditions. Noisy operation is the principal effect of irregular spacing.

Gear Checking Fixture

Moving the pin from space to space is somewhat tedious when several gears are to be checked. To avoid this and speed the checking operation, the pin can be combined with the indicator spindle. One method is shown in an accompanying illustration, where the pinholder is made from the solid. However, such a holder could be made from strip stock. The pin is positioned in a 90 deg. groove about 0.040 in. deep and held in place with two wire springs.

With either a solid or separate pin arrangement, means should be provided to hold down the indicator base and test centers or V-blocks so that their relative positions cannot change during checking. Needless to say, the gear should be turned easily, but not loosely. The pin should be carefully aligned and centered directly above the mandrel so that it is free to position itself in each tooth space. By this means, gear checking can be done fast.

Gear that have been produced with topping cutters are finished on the outside diameter at the same time that the teeth are cut. For this reason, such gears can be checked for pitch line runout by indicating the outside diameter, or tops of the teeth.



Various sizes of gears can be checked in pairs on this fixture. Pins in the fixture are adjustable to provide for varying center distances

Carbide-Tipped Face Mills Best With 10-deg. Negative Radial Rake

BY F. W. LUCHT, DEVELOPMENT ENGINEER, CARBOLOY COMPANY

Series of tests with face mills cutting SAE 1045 steels, with hardness of 200 Brinell, prove that positive rake angles are least satisfactory in providing long, consistent cutter life

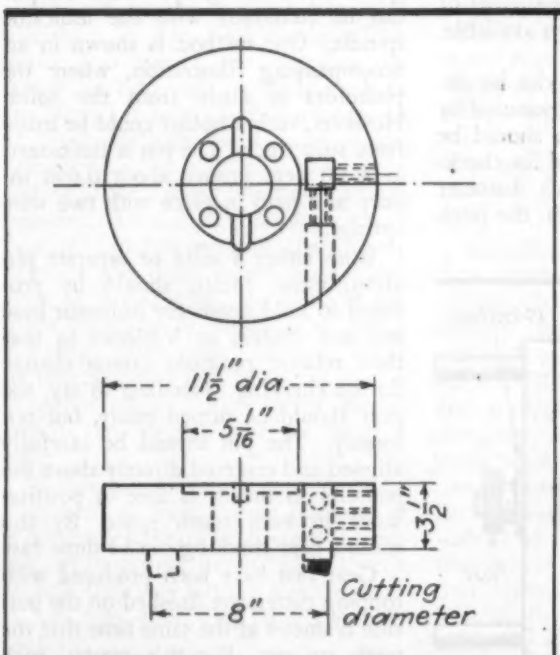
THE CORRECT RADIAL RAKE to be used on carbide cutters for milling steel has generally been determined by "cut-and-try" methods. No authentic information based on controlled tests has been available. For this reason, an investigation into the subject of radial rake for the face milling of steel with carbides has been included in the steel milling development program now being conducted at Carboloy Company's engineering research laboratory in Detroit. Information given here is a report on the progress to date on the investigation into radial rakes. This work is still in progress because it is thought that the use of the proper radial rakes on a cutter, the correct method of maintaining them, and the correct method of positioning them in relation to the point where the tooth enters the work all have a direct bearing on the success or failure of a steel milling operation.

In establishing the procedure to be used throughout the series of face milling test runs, SAE 1045 steel was selected as the material to be machined, because it was considered to be the most representative of all the steels milled today with carbide cutters. The steel billets were forged to a uniform size—5x6x36 in. All corners had a maximum radius of ⅛ in. The forged billets were heat-treated and drawn to a Brinell hardness of 190-210.

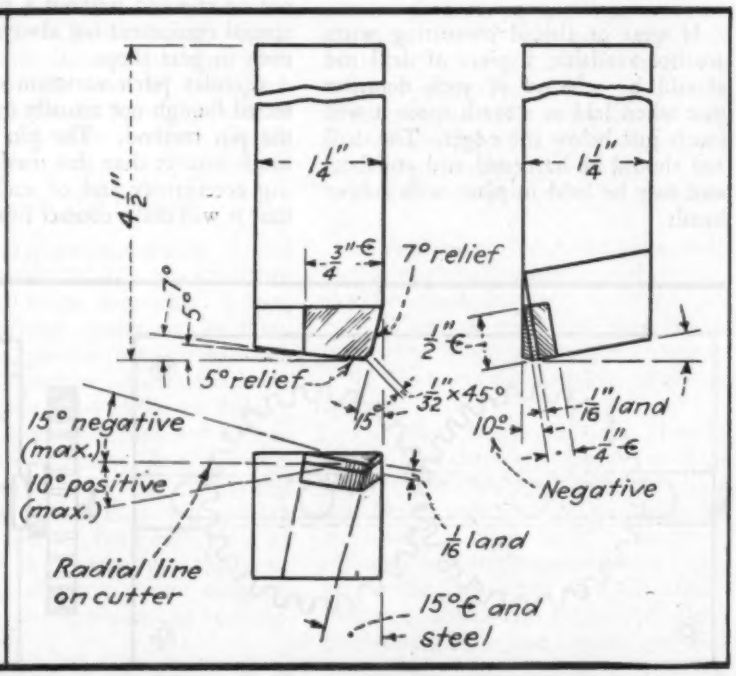
All tests were run on a No. 5HM vertical milling machine with separate motors for spindle drive and feed. The main spindle had 20 hp. available and 5 hp. was provided for the feed and rapid traverse. The machine was equipped with two separate wattmeters, together with appropriate current and potential transformers to measure the power actually consumed by the main spindle motor and the feed and rapid traverse motor.

The cutter head of the face milling cutter was made from a steel forging. It was located from—and bolted to—the spindle nose of the machine. The slot for the toolbit is parallel to the axis of the cutter head and the toolbit is clamped in place by setscrews.

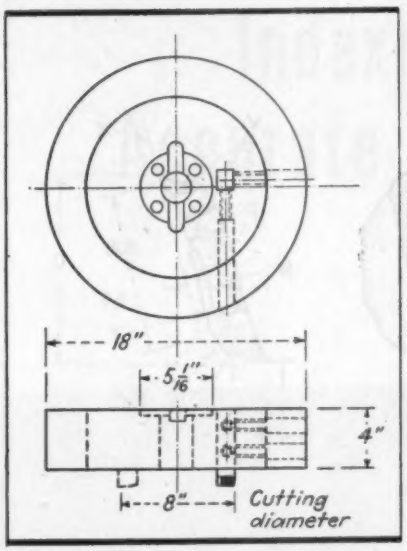
In all, eleven different designs of toolbits were used. Each toolbit had a 10-deg. negative back rake. When the bit was assembled in the cutter head, this 10-deg. negative back rake produced a 10-deg. negative axial rake.



Details of the cutter head and toolbit assembly of the cutter used in making determinations



Eleven toolbits of similar design were used. Each was made with 10-deg. negative back rake and varying side rake



Vibration was eliminated by enshrouding the cutter in a flywheel

Combined weight of flywheel and cutter was 255 lb., well within limits of the machine spindle

Side rake varied, each tool being given a different one. These side rakes were 15, 12, 10, 8, 5, and 2 deg. negative; 0 deg.; and 2, 5, 8 and 10 deg. positive. When the toolbit was assembled in the cutter head, each of these *side rakes* produced a *corresponding radial rake*.

All tools had tips of Carboloy grade 78B, which is a steel milling grade of carbide. All tips were ground on a single-point tool grinder using a 60-grit silicon carbide wheel for roughing both the carbide and the steel. A 220-grit diamond wheel was used for the final sharpening of the carbide only.

Cutting edges on all tools were inspected at twenty magnifications before each milling run started. Each edge was brushed lightly with a 320-grit silicon carbide stone at about a 45-deg. angle to the face of the tool to remove any slight irregularities before assembling the tool in the cutter head.

Preliminary runs showed that an 8-in. diameter face milling flycutter (with only one tooth) gave extremely erratic results for feeds per tooth greater than 0.006 in. However, when feeds per tooth were increased to more than 0.010 in., the gears in the machine spindle clattered and the machine developed a tendency to "dance."

In an effort to overcome this difficulty, the cutter head was enshrouded with a steel flywheel 18 in. in diameter and 4 in. thick. The addition of the flywheel brought the weight of the combined unit—cutter head and flywheel—to 255 lb. This weight was well within the weight limit of the spindle, which was 500 lb. The flywheel unit was carefully balanced with the cutting tool in place. Use of this flywheel made it possible to obtain uniform results where before they had been erratic. It also permitted the use of feeds per tooth as high as 0.040 in. without any undue gear clatter or machine vibration.

The outside diameter of the cutter overhung the work 1¾ in. at the side where the cutting edge entered it. This set-up permitted the cutting edge to contact the work back from the cutter face, because this condition is known to improve cutter life. Such positioning of the cutter in relation to work also places a positive pressure towards the column of the machine and tends to eliminate chatter.

Feed of 2 in. per min.

Previous runs had indicated that a speed of 238 r.p.m. (498 ft. per min.) with the 8-in. face mill gave the longest cutter life when milling SAE 1045 steel heat-treated to a Brinell hardness of 190-210. Therefore, this speed was used throughout on the tester.

A feed of 2 in. per min.—which, under these conditions, was 0.0084 in. per tooth—was maintained. This had two advantages. First, it is about the minimum feed per tooth which gives good cutter life, and, second, this feed can be obtained on most of the present day milling machines providing that the number of teeth in the cutter is kept down so that the power required will be within the capacity of the machine.

A depth of cut of 5/32 in. was selected for all tests. This figure was chosen because it represents the average depth which will cause wear similar to that obtained by machining deeper cuts, and yet which does not necessitate the removal of an excessive amount of steel.

As a further safeguard against erratic results, and also to help provide identical conditions on each run, the cutter was not allowed to break through the end of the billet.

Each tool was run until the first sign of wear was noted on the chips coming from the cut. As soon as a well-defined deep blue line paralleling the length of the chip appeared—indicating the first breakdown or chipping-out of the tool's edge—the run was stopped and the tool removed from the cutter head. The machine operator also easily can detect the moment the breakdown of the cutting edge takes place because it is accompanied by a characteristic change in sound.

The exact nature of the tool wear was determined by analysis and recorded after each tool had been run. This was done by inspecting the tool with a twenty-power glass. The widths of the wear lands along the bevel angle, chamfer, and face; the distance which the cutting edge had worn back from the original bevel outline; and the width of the crater on the face of the tooth were all determined. These values were then represented in a free-hand sketch which showed the development of the cutting edge. All unusual signs of breakdown of the cutting edge were indicated thus.

Incidentally, use of this method of recording wear on a tool might be recommended when reporting milling jobs on which assistance is requested from carbide tool suppliers. Such sketches have been found to be most helpful in analyzing wear factors, and eliminate the necessity for sending the actual cutting bits or tool blades.

At the end of the series of runs, the results of the tests were graphically portrayed by plotting the number of linear inches milled by each tool up

until the cutting edge first showed signs of failure. One line was then drawn through the points showing the maximum number of inches milled. A second line was drawn through the points indicating the minimum number of inches milled in each case.

Conclusions Reached

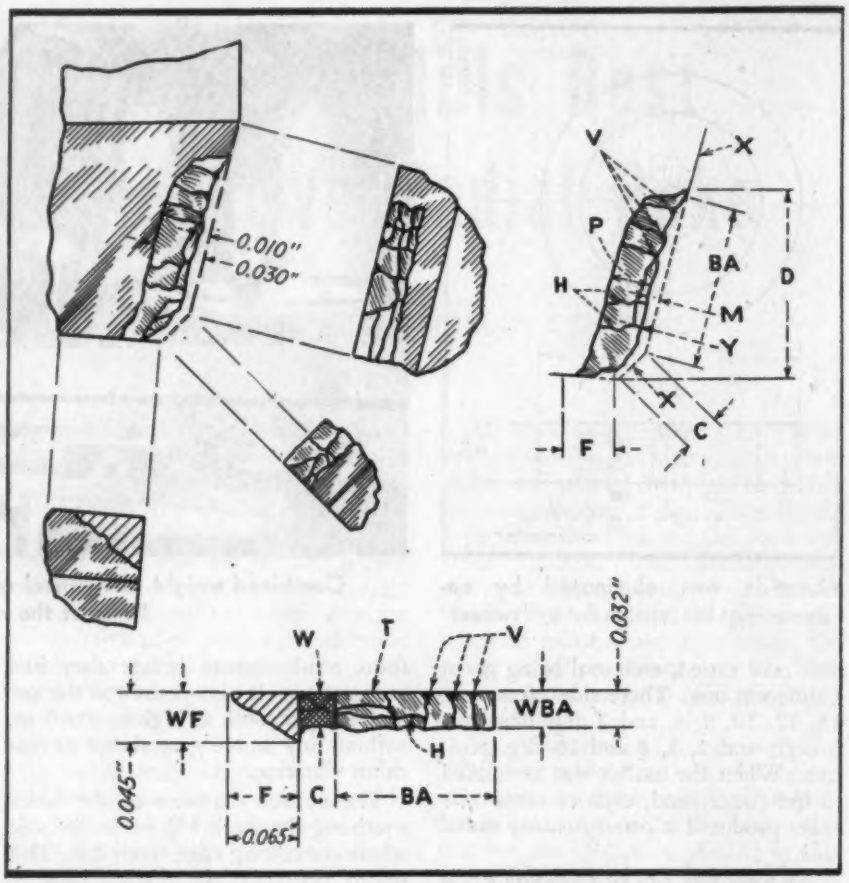
Under the specific conditions of the test, the following conclusions have been reached:

1. A 10-deg. negative radial rake gave the longest cutter life for each run.
2. A 12-deg. negative radial rake gave shorter but more consistent cutter life for each run.
3. Negative radial rakes greater than 12-deg. gave still shorter cutter life, together with wider fluctuations.
4. Negative radial rakes less than 10 deg. have the shortest cutter life. Wide fluctuations were noted.
5. Minimum cutter life, together with extreme fluctuation, was obtained with positive angles.

In order to determine the reason why a 10-deg. negative radial rake gave the longest cutter life, the relationship of the negative radial rake angle on the face of the tool was carefully checked with the outline of the work at the point where the cutting edge along the bevel entered the cut.

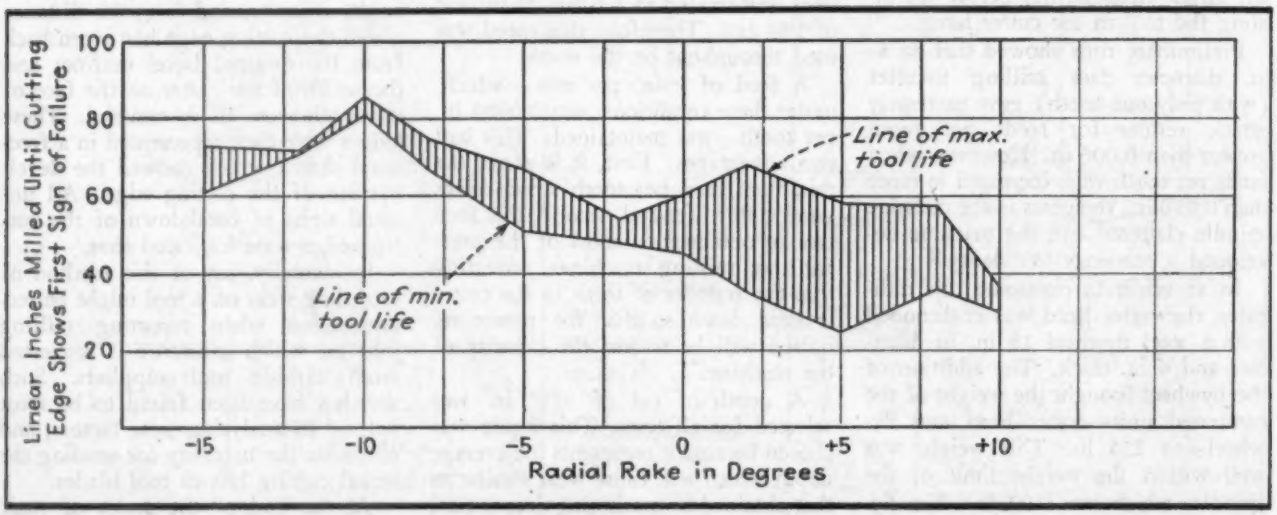
In other words—the best operating conditions will be obtained when milling steel with carbides if the face of the tooth first contacts the work at a distance equal to the feed per tooth back from the cutting edge, and at a distance from the face of the cutter which is equal to the depth of cut.

This article is based on a paper given before the A.S.M.E. annual meeting in New York.



D—Depth of Cut
BA—Bevel Angle
C—Chamfer
F—Length of Wear Land on Face of Cutter.
WBA—Width Wear Land on Bevel Angle
WC—Width Wear Land on Chamfer
WF—Maximum Width Wear Land on Face
T—Face of Cutting Tooth
X—Origional outline of Cutting Tooth
Y—Outline of Tooth After Breaks down Occurred and Wear wa- Recorded
V—Points of Breakdown
H—Fair hair-like lines. Many of these only become noticeable at 20 magnifications.
P—Width of Crater
M—Amount of cutting edge wore back up to the time breakdown occurred.

Details of the breakdown of a cutter's edge show the development



Graphic records of tests showed that a 10-deg. negative radial rake proved most satisfactory and that minimum cutter life resulted from positive rake angles

Indexing Templets Permit Accurate Riveting at High Speed

BY R. M. ALEXANDER, DOUGLAS AIRCRAFT COMPANY

Mechanical means are provided for lifting and supporting fixtures when the bulk or weight of an assembly is too great to be handled easily by an operator

Photographs of master layouts serve as guides in preparing indexing templets. Savings in tooling are made by this means

INDEXING TEMPLETS have been developed at the Douglas, Santa Monica, plant which simplify the riveting of major aircraft subassemblies, insure greater accuracy and make possible full utilization of the high riveting speed of the Erco machine, which punches the holes, inserts and upsets the rivets. A considerable saving in tooling costs is also realized by the elimination of contributory tooling and design. An indexing templet requires only 40 percent of the time required formerly for assembly of the jigs and fixtures.

The indexing templets are made from photographs of a master layout to insure accuracy. No tooling templets or other tools are used. All slots are cut in accordance with the photographed lines and all clamps for angles above the web are located in this way. Locating pins for webs, or doublers, are located directly from the master layout. Applied tooling for component assembly parts indicates only the size and shape of each part. Predrilling is eliminated and applied tooling does not carry any rivet hole information. Costly hole coordination is not used. The base of the templet is three sheets, or laminations, of Alclad, eliminating many costly operations that would otherwise be necessary in cutting slots through the templet for angles projecting below the webs.

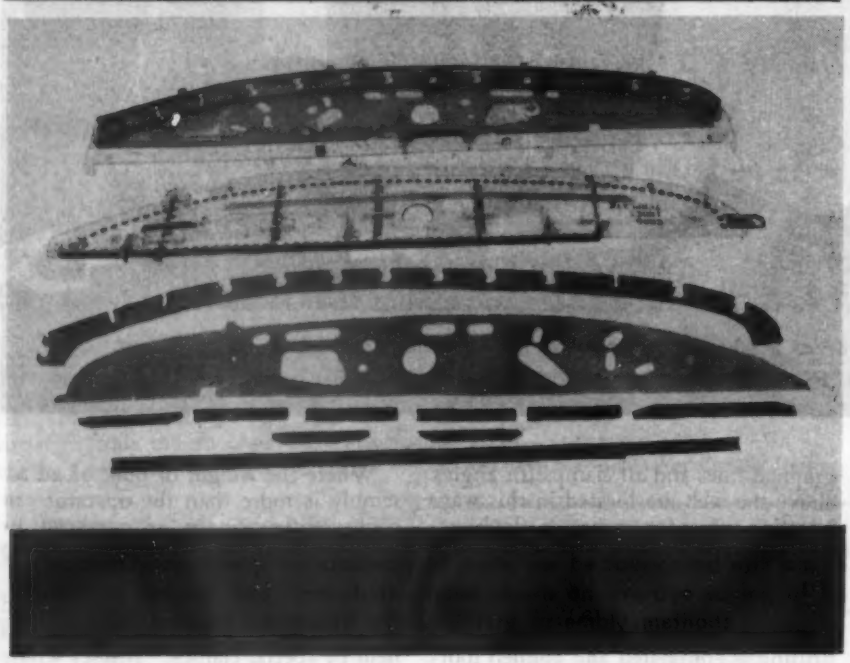
Indexing of the stripper pad of the riveting machine makes certain the positve location of every rivet required in the work. Correct edge distance is always maintained and a properly adjusted machine will upset the rivets correctly at each stroke. Bushings can be inserted to permit drilling of matching holes for castings, or subsequent assemblies after the parts are riveted and before removal of the templet.

Where the weight or bulk of an assembly is more than the operator can conveniently manage, an overhead, or a spring-loaded radial arm handling fixture is used to hold it.

All webs and doublers are located above the templet by tooling pins and held by special clamps. Angles whose standing legs project below the web are located by clamps, or removable bridges, while those angles whose legs project below the web and through the templet are located by slots. The pressure of the web upon the angle below the surface is sufficient to hold it in the proper location. The templet is cut out for the flat leg of these latter angles, to permit the web to lie flush with the surface of he templet.

Cam-Action Clamps Designed

As the impact produced by the punching operation tends to render any standard clamp useless in a short time, it was necessary to develop clamps which could withstand this shock over a reasonable period. As screw-type clamps consumed excessive loading



time the cam-action clamps were designed. They have proved satisfactory and require a minimum of repair or replacement.

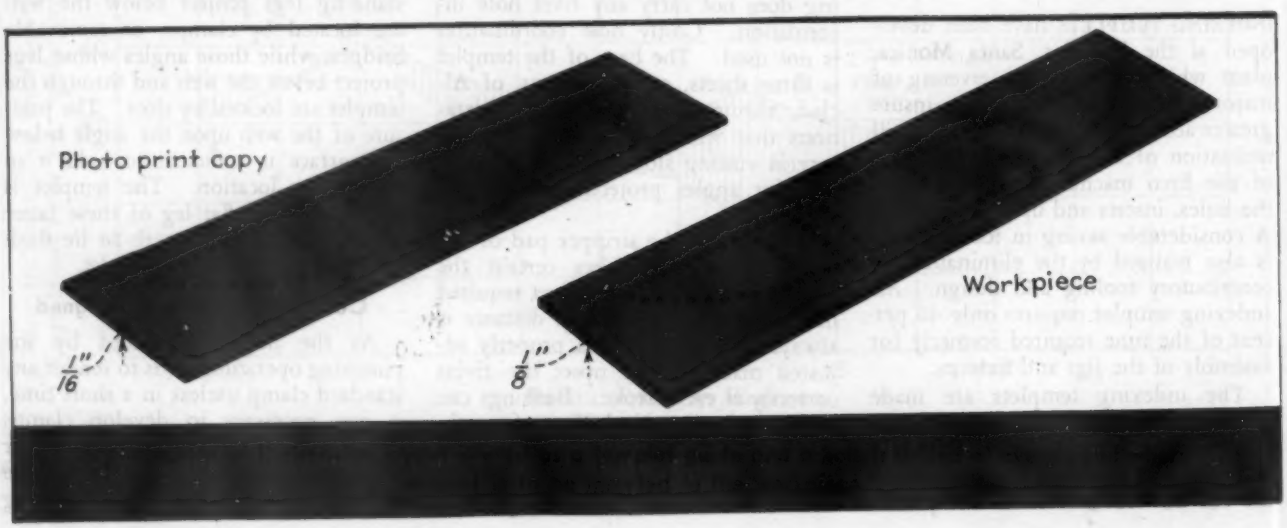
The standard templet color code is painted on the under side of the templet and is visible to the operator by means of a mirror. It serves as a guide for the location of the indexing holes. When an assembly is completed it is inspected and passed on to the next assembly. The rejection rate has been reduced considerably by use of the templets and correct edge distances, consistent riveting and correctly located parts all contribute to increased production.

The stripper pads used in these operations have been adapted to permit the insertion of rivets closer to the heel of the angles, or channels. These pads have been cut back as much as half of their diameter, with no deterioration in efficiency or durability. The stripper pads tend to break somewhat rapidly, but the increased versatility of the units greatly offsets the loss of these easily replaced parts.

Limited to One Size of Rivet

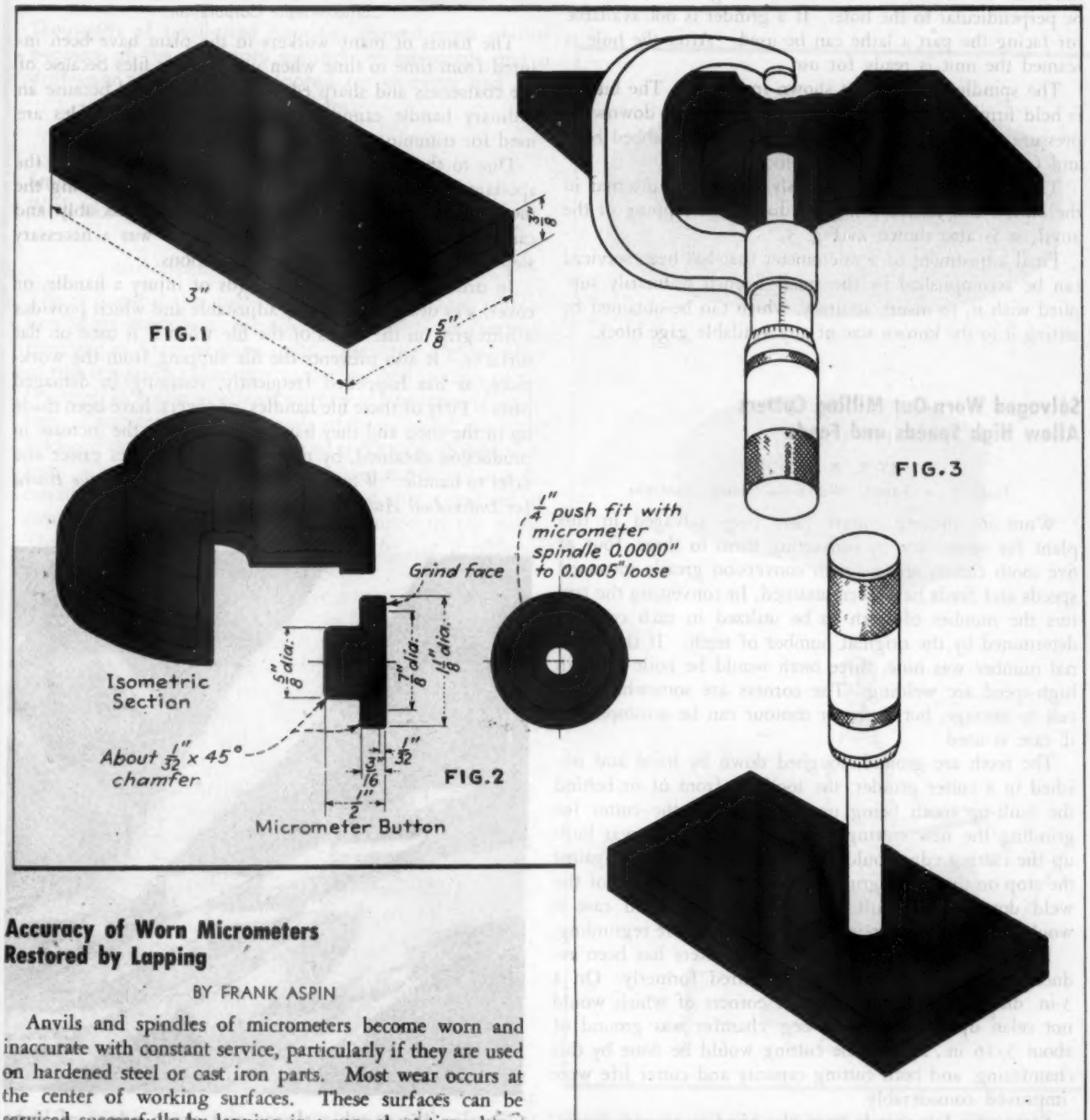
Irrespective of the efficiency gained by this templet method of riveting, however, formed parts cannot be satisfactorily assembled and the templet is not recommended where rivets of more than one diameter are used, or where extreme variations in thickness of the metal occur because of the varied length of rivets required, which necessitates continual machine adjustment.

The rapidity with which the indexing plates can be constructed, the economies they effect and the high degree of uniformity of present production indicate a wide use of them in the future. Their development by Douglas is to be continued because of what has been accomplished by their use.



Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



The working surfaces of micrometers which become inaccurate when used repeatedly can be restored to complete accuracy by lapping and adjustment

Accuracy of Worn Micrometers Restored by Lapping

BY FRANK ASPIN

Anvils and spindles of micrometers become worn and inaccurate with constant service, particularly if they are used on hardened steel or cast iron parts. Most wear occurs at the center of working surfaces. These surfaces can be serviced successfully by lapping in a very short time, however, and their original accuracy fully restored.

The type of lapping block used for the purpose, made of cast iron, is shown in Fig. 1. The surfaces, *G*, should be

ground flat and parallel, preferably with a surface grinder, although a milling machine, if handled carefully, will be satisfactory. One side of the block should be indicated as the working surface, as shown by *A*. A small amount of flour emery and light machine oil, mixed to the consistency of a thin paste, should then be applied and worked into the surface *A*. Excess paste should be removed.

The micrometer button is shown in Fig. 2 and the isometric section shows the outline of the part. The base of the button is large enough to provide a good bearing surface. The fit between the micrometer spindle and the button must be close, as indicated and the ground face must be perpendicular to the hole. If a grinder is not available for facing the part a lathe can be used. After the hole is reamed the unit is ready for use.

The spindle is lapped as shown in Fig. 3. The button is held firmly against the block, but only slight downward pressure should be applied as the assembly is rubbed back and forth over the face of the block.

The spindle that was previously serviced is inserted in the button and retracted slightly during the lapping of the anvil, as is also shown in Fig. 3.

Final adjustment of a micrometer that has been serviced can be accomplished by the small wrench ordinarily supplied with it, to insure accuracy, which can be obtained by setting it to the known size of any available gage block.

Salvaged Worn-Out Milling Cutters Allow High Speeds and Feeds

BY R. A. SCHULTZ
Noblett & Forest, Woodville, South Australia

Worn-out milling cutters have been salvaged in this plant for some time by converting them to three, four or five tooth cutters and by such conversion greatly increased speeds and feeds have been attained. In converting the cutters the number of teeth to be utilized in each case are determined by the original number of teeth. If the original number was nine, three teeth would be built up with high-speed arc welding. The corners are somewhat difficult to manage, but a proper contour can be accomplished if care is used.

The teeth are ground, roughed down by hand and finished in a cutter grinder, the tooth in front of or behind the built-up tooth being used to position the cutter for grinding the new cutting edge. If every tooth was built up the cutting edge could not be used for locating against the stop on the cutter grinder because of penetration of the weld down to the gullet of the tooth. In such case it would be necessary to reindex each cutter before regrinding.

Machining time with these rebuilt cutters has been reduced to one-half of the time required formerly. On a 3-in. diameter shell end mill, the corners of which would not celan up squarely, a 45-deg. chamfer was ground of about 3/16 in., so that the cutting would be done by this chamfering, and both cutting capacity and cutter life were improved considerably.

Some very fast speeds were also tried as an experiment. In one case, using four teeth, 1/32 in. feed per tooth, or ⅛ in. per revolution of the cutter, with the shell end mill averaging a 1/16-in. cut in cast iron through the skin, required grinding of the cutters at approximately the same intervals as the conventional shell end mill which at 200 r.p.m. of the cutter gave an unusually high rate of feed. The finish was average on this particular job. Machining of the pads on the under side of the bearing blocks gave a finish that was better than necessary. The cutting time was one-quarter of that required with the previous set-up.

Cover for Heavy Files Removes Hazard of Injury

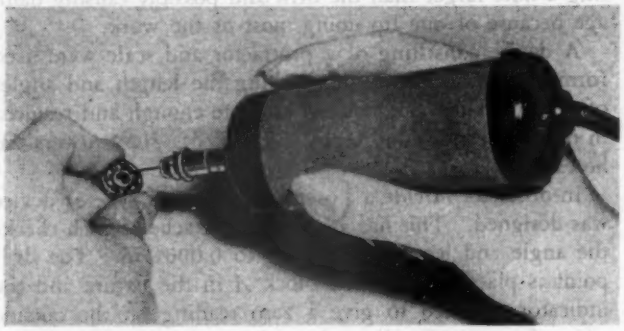
BY L. TRUTY
Curtiss-Wright Corporation

The hands of many workers in the plant have been injured from time to time when using heavy files because of the coarseness and sharp edges of the tool and because an ordinary handle cannot be attached when these files are used for trimming the edges of sheet metal parts.

Due to the hazard of injury to workers' hands and the spoilage of work caused by files slipping and marring the metal parts, production was slowed up appreciably and caused a bottleneck where filing of parts was a necessary step in the regular run of shop operations.

In order to eliminate the hazards of injury a handle, or cover, was designed which is adjustable and which provides a firm grip on the edges of the file when it is used on flat surfaces. It also prevents the file slipping from the workpiece, as has happened frequently, resulting in damaged parts. Fifty of these file handles, or covers, have been made up in the shop and they have contributed to the increase in production obtained, by making the larger files easier and safer to handle. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Covering the rough surfaces and sharp edges of large files with a holder removes the hazard of injury to the operator's hands and prevents slipping of the file and marring of the work



Thousands of small-sized bearings showed signs of rust because of the necessary omission of lubricants and a draftsman's eraser was adapted for cleaning and burnishing them

Small Bearings Cleaned and Burnished With a Draftsman's Eraser

BY HOWARD BARRIER
International Business Machines Corporation

It is essential that ball bearings be run without lubrication as the viscosity of any oil interferes with the free running and accuracy of these units. Even the slightest trace of rust is equally a detriment to the best performance of the bearings, as it also interferes with their free-running qualities. Examination of thousands of bearings in the plant disclosed that a large percentage of them were spotted with rust. The bearing manufacturers could not accept any reconditioning orders for the duration so that a method of cleaning off the rust had to be developed in the plant. They did offer to allow 20 percent of the cost if returned and to supply new ones at full cost.

The problem was solved by the adaptation of a draftsman's motor-driven eraser, in which is inserted a short length of wire, which in this case was an ordinary paper clip, roughly sharpened to a point. The vibration of this point against the rusted portions of the bearings easily and quickly removes the rust film and also has a burnishing effect on the metal. All inside portions of the bearings can be reached with the revolving point and cleaned, something that had been impossible with all other methods tried. Estimated savings were realized of $3,979 by cleaning bearings, figured against the cost of new ones less 20 percent, the allowance set by the manufacturer for return of the rusty units. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Rigid Support Extends Life Of Carbide-Tipped Lathe Tools

BY C. M. HUNTLEY

Considerable difficulty had been experienced in securing a firm grip on tools with holders using wedges. In order to overcome such difficulty the holder illustrated was designed.

This type holder has proved to be particularly useful when carbide-tipped tools are used, as the holder stands in a vertical position, instead of at an angle. It gives the rigid support essential for the best life of such tools, which support could not be obtained with wedges. The firm grip of the holder is due to the supporting surfaces of the parts *A* and *B*, the complete assembly of the parts being shown at *C*.

There has been no instance of failure to hold since the device was first used and it has proved so useful and satisfactory that a quantity sufficient to equip all lathes in the shop has been made up.

Toolholders equipped with ordinary wedges did not provide the firmness required for cutting tools in lathe operations so this holder was designed to give the rigid support essential to long tool life

Indicating Device Checks Accuracy of Cutting Lips of Reground Drills

BY WILLIAM ENTWISTLE
Packard Motor Car Company

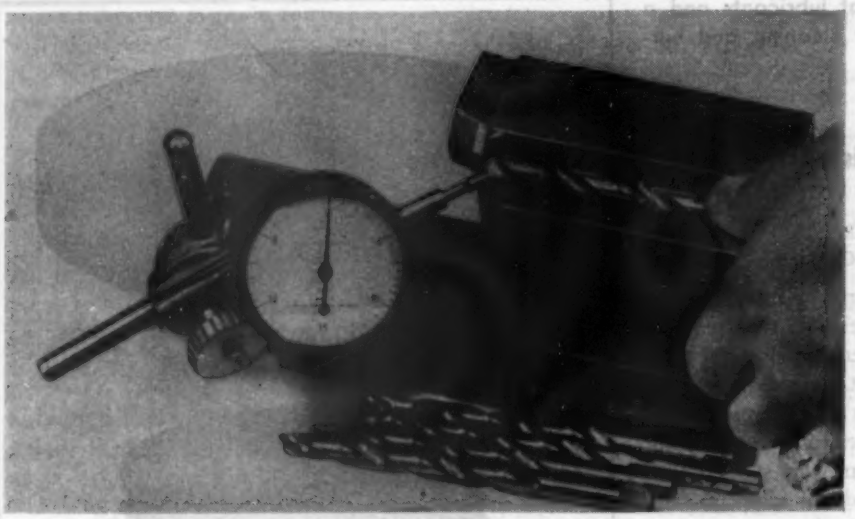
Oversize holes in workpieces are due principally to improperly ground drills, usually as a result of failure to give proper consideration to three important points, viz, lip clearance, length and angle of the lips and location of the point and dead center in relation to the axis of the drill.

When the two cutting lips are not identical the point will be thrown off center, cause the drill to wobble, thereby cutting a hole larger than the drill and possibly causing damage because of one lip doing most of the work.

A device consisting of a protractor and scale were used formerly in this plant for checking the length and angles of reground lips, but was not accurate enough and resulted in many rejections and scrapping of parts due to oversized holes.

In order to provide a closer check another type of device was designed. This has an indicator attached which checks the angle and length of the lips to 0.0001 in. The drill point is placed against the block *A* in the fixture and the indicator adjusted to give a zero reading on the outside edge of one cutting lip. A reading is taken on the other lip and the indicator shows clearly whether or not the lips are identical and, if not, how much stock should be removed from either lip to make them identical and whether or not the drill has a concentric point.

Adoption of this drill checking fixture has increased the average time between grindings by 200 percent. It has also eliminated a considerable amount of drill breakage and has eliminated the scrapping of parts because of oversize holes. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Wastage of parts due to oversize drilled holes can be reduced or eliminated if reground drills are accurately tested for concentric points and identical cutting lips

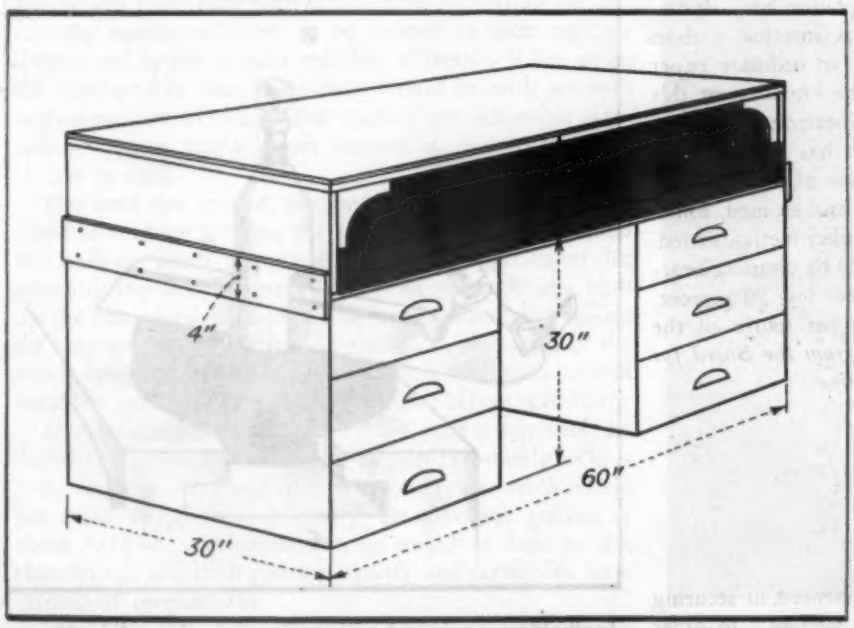
Altering Drafting Furniture Provides More Reference Space

BY C. E. SCHIRMER

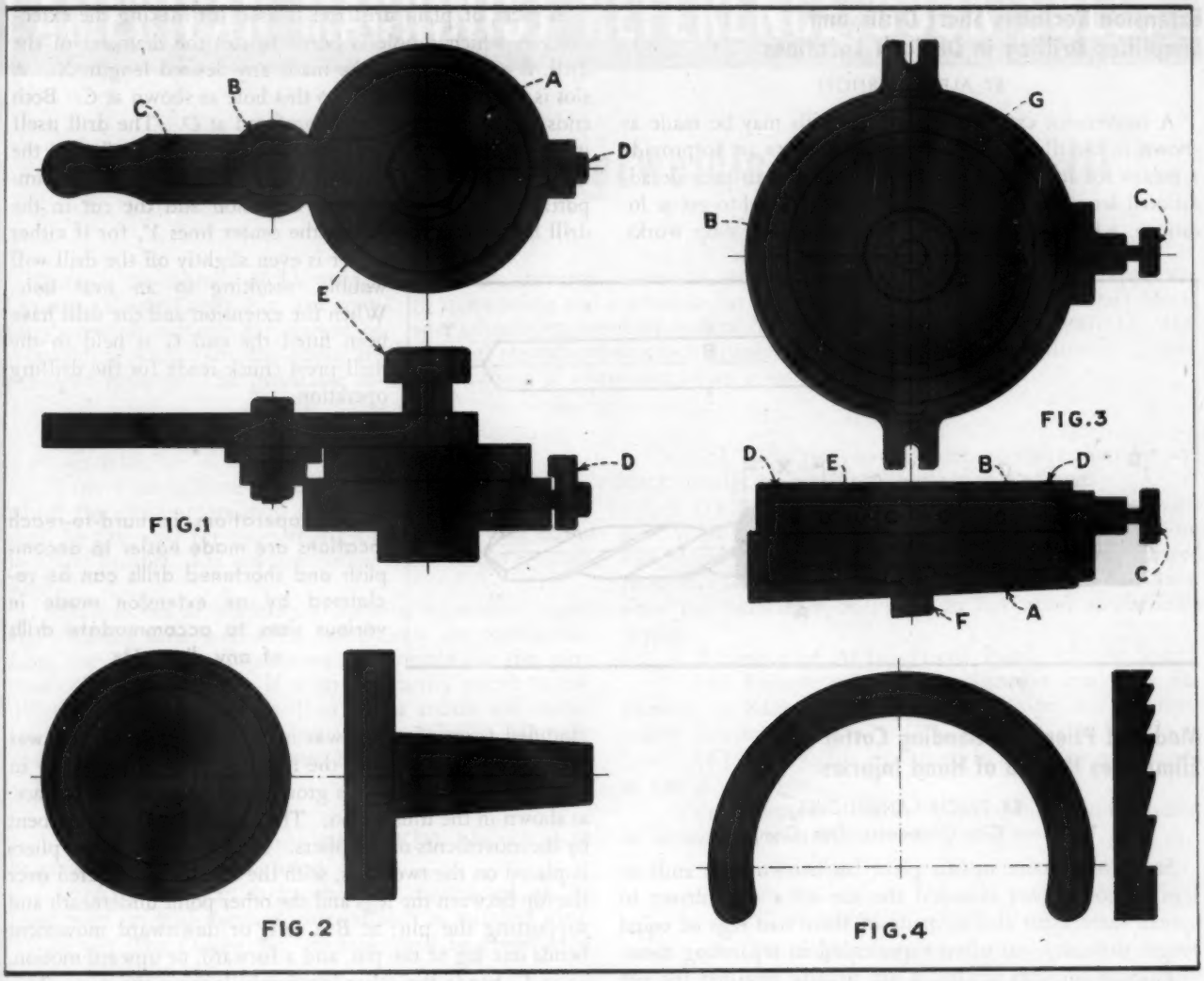
The increase in personnel in drafting and engineering departments generally, due primarily to the war effort, frequently makes necessary the finding of additional or adequate room without the advantage of increased floor space.

One engineering department solved the problem of providing increased reference space for its draftsmen by adding an extension, or second deck, mounted on existing desks or tables, as shown in the illustration. The extensions were located immediately behind the draftsmen, for convenience in referring to other drawings and references in preparing the work in hand.

The additonal space provides room for reference books, prints, or parts of machines, the drawing board being kept free for making layouts or detailed drawings. The costs of altering desks and tables is negligible compared to the advantages gained.



The problem of additional storage space for reference material in drafting rooms can be solved easily by a small amount of remodeling of desks and tables convenient to each draftsman



This special fixture was designed to provide uniformity of the ring dials required continually as replacements on subway car controllers because of hard service requirements

Fixtures for Machining Controller Ring Dials

BY MICHAEL AXLER

The continuous and hard service to which power controllers are subjected on the cars of the subway system, New York, requires frequent renewal of the notched ring dials which hold the controller handle at the various settings by which the speed of the train is governed.

In order to elimnate the necessity for making up special tools each time new rings had to be made, or old ones repaired, a set of jigs and fixtures was made.

As the first step in the operation some pieces of 5/8 in. cold rolled steel were cut to the length required. These pieces were heated to a cherry red and the two clamped together with clamp *D*, which is attached to roller *A*, as shown in Fig. 1, which is a bending fixture. The roller, *B*, which is attached to the handle *C*, was then put over the part, which was rolled to the correct size and shape. The handle, *C*, is held on the block *B* and the entire fixture is held in a vise.

The next step was to reduce the thickness of the part to 9/16 in., which was done on a lathe, the part being held by a tapered shank, as shown in Fig. 2. The parts were first set in a groove of the jig, locked in position by three setscrews and then machined to the correct thickness. After machining the same fixture was used as a drill jig, as the holes to be drilled had to be located so that the spacing between them and the ratchet teeth would be exactly the same on all the dials, to insure correct fit on a controller. The inserted plate *G*, in Fig. 3, was used as a stop.

The ratchet teeth on the dials were then milled. The fixture consists of the base, *A*, which is tapered to conform with the taper on the ratchet teeth of the dial. The dial fits into a groove in the part *B* and over a number of pins for correct location and is held in place with setscrews. The top piece, *B* has several located holes in the side, *E*. Key *F* locates the fixture which is then bolted in the slot on a milling machine. After milling the first tooth the base, *A*, is moved by handle *C* to the next location.

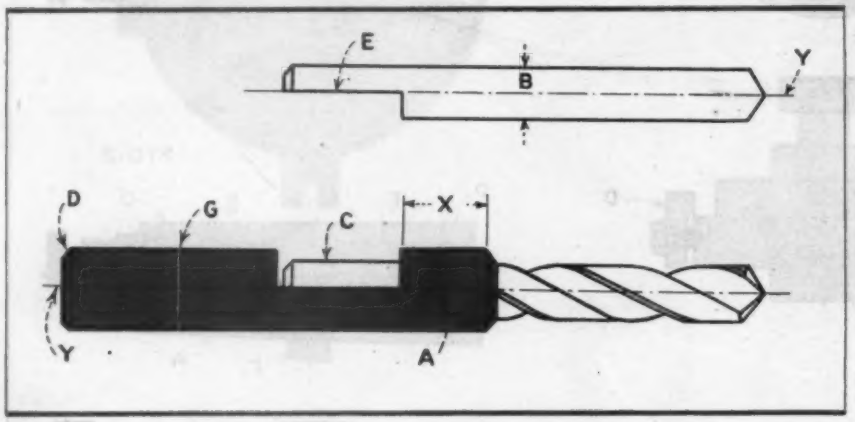
The finished dial, on which the ratchet teeth are not equally spaced and which had to be cut at a 6 deg. angle, is shown in Fig. 4.

Extension Reclaims Short Drills and Simplifies Drilling in Difficult Locations

BY ALEX S. ARNOTT

A convenient extension for twist drills may be made as shown in the illustration. The main objects are to provide a means for reclaiming shortened drills and to provide additional length in order to reach work in hard-to-get-at locations, which are frequently encountered in shop works.

A piece of plain drill rod is used for making the extension, in which a hole is bored to suit the diameter of the drill, *B* and which can be made any desired length, *X*. A slot is cut at a right angle to this hole as shown at *C*. Both ends of the extension are chamfered at *D*. The drill itself is cut at *E* and is fitted into the hole with the flat on the drill, in line with the flat on the extension. It is most important that the slot in the extension and the cut in the drill be made accurately to the center lines *Y*, for if either center is even slightly off the drill will wobble, resulting in an oval hole. When the extension and the drill have been fitted the end *G* is held in the drill press chuck ready for the drilling operation.



Drilling operations in hard-to-reach locations are made easier to accomplish and shortened drills can be reclaimed by an extension made in various sizes to accommodate drills of any diameter

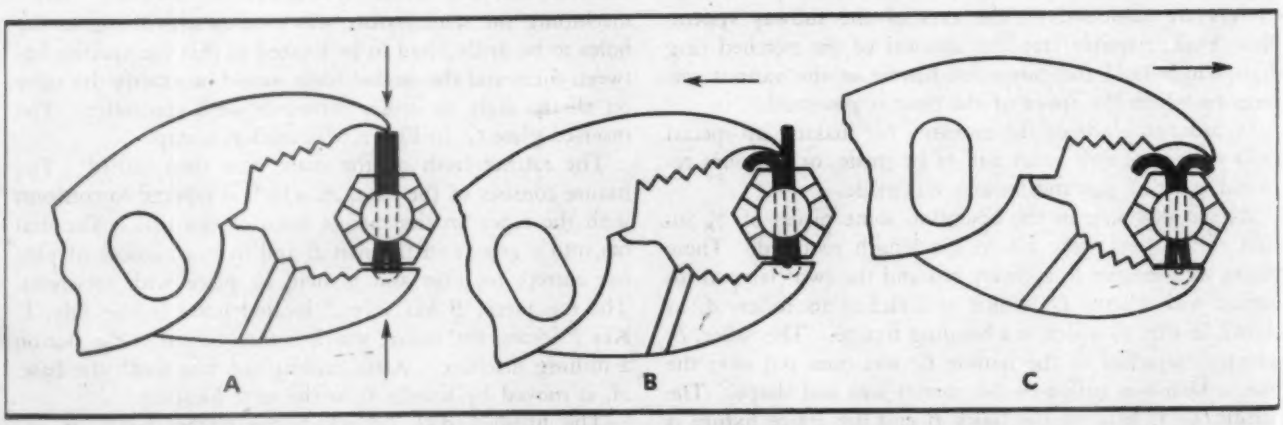
Modified Pliers for Bending Cotter Pins Eliminates Hazard of Hand Injuries

BY ERICH LANGNICKEL
The Flour City Ornamental Iron Company

Standard practice in this plant for bending the ends or legs of cotter pins included the use of a screwdriver to spread them apart and as many of them had legs of equal length difficulty was often experienced in separating them.

Folding the legs around a nut usually required the use of pliers to hold the pin. Inaccessiblity of many of the nuts and the tendency of the screwdriver to slip frequently caused hand injuries and made such work a slow, irritating job.

In order to eliminate these hazards and loss of time, a modified form of pliers was made up. A depression was sunk in one jaw to hold the heads of cotter pins firmly in place. The other jaw was ground to form a curved surface, as shown in the illustration. The legs of cotter pins are bent by the movements of the pliers. At *A* the point of the pliers is placed on the two ends, with the sharp end centered over the top between the legs and the other point underneath and supporting the pin; at *B* a left, or downward movement bends one leg of the pin, and a forward, or upward motion, as at *C*, bends the other leg firmly locking the pin. This safe and easy method of bending cotter pins has brought about a large saving in time, has increased production and has removed the hazard of hand injuries. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Separating the legs of cotter pins and folding them around a nut or other part, frequently a difficult job, has been simplified through modified pliers by which pins can be held and folded with one hand

AMERICAN MACHINIST REFERENCE BOOK SHEET

Process Control for Spotwelding Aluminum—III

Through the courtesy of Fleetwings Division, Kaiser Cargo, Inc., the company's process manuals for control of spotwelding aluminum are being reproduced serially. The preceding installments covered causes of trouble in spotwelding and a schedule for preventive maintenance of equipment. The material reproduced herewith discusses the cleaning of aluminum alloys prior to spotwelding. Applicable specifications are "Cleaning of Aircraft Metal Surfaces" (Army 98-20007-4) and "Protection of Naval Aircraft" (Navy SR-15d).

A. General.

Parts with inclosed sections or lapping surfaces, from which the cleaning solution cannot be thoroughly rinsed, shall be prepared for spotwelding by brushing with stainless-steel brushes. Do not use carbon-steel brushes or steel wool.

Tradenames of proprietary cleaners, solution strength and cleaning time with these compounds are reproduced from the Fleetwings process manual merely for the purpose of exact statement. If other companies prefer to use different compounds, they will of course follow the manufacturer's recommendations concerning solution strength and cleaning time, or alter them to suit shop conditions.

B. Equipment:

1. Tanks:

(*a*) Alkaline cleaning tanks (KDL No. 1) shall be constructed of iron or wood.

(*b*) Nitric-acid tanks shall be constructed of, or lined with, an acid-resistant material such as stainless steel.

(*c*) The Oakite No. 30 tank shall be constructed either of steel or wood.

(*d*) Only a wooden tank may be used to hold hydrofluosilicic acid.

(*e*) Rinse tanks shall be constructed so that a constant flow of fresh water shall be maintained.

2. Exhaust Systems:

Suitable exhaust systems shall be provided to remove the fumes arising from the acid tanks. The exhaust system should preferably draw the fumes directly from the side of the tank rather than from above.

3. Parts Handling:

Parts shall be placed in acid-resistant racks or baskets, or suspended from acid-resistant hooks.

C. Procedure:

1. Cleaning of Non-Alclad 24ST Detail-Parts—Lightly Soiled:

(a) Remove oil and identification marks by immersing in KDL No. 1 for approximately five minutes.

(*b*) Thoroughly rinse parts in hot water.

(*c*) Dip parts for about one minute in nitric-acid solution.

(*d*) Thoroughly rinse parts in cold running water.

(*e*) Dip non-Alclad parts for two to three minutes in Oakite No. 30 solution.

(*f*) Thoroughly rinse in cold running water.

(*g*) Dip parts for about one minute in nitric-acid solution.

(h) Rinse parts in cold-running water. Remove any black smudge by brushing lightly with a sponge.

(*i*) Blow off excess water with clean compressed air. Wipe flat parts with a chamois to remove water stains. Flat sheets or nose skins may be stood on edge or flanged parts may be dried with an air blast. After the cold-water rinse the parts may be rinsed in hot water to facilitate drying.

2. Cleaning of Alclad Detail Parts—Lightly Soiled:

(a) Remove oil and identification marks by immersing in KDL No. 1 aluminum cleaner for approximately five minutes.

(*b*) Thoroughly rinse parts in hot water maintained at 180 F. or higher.

(*c*) Immerse parts in hydrofluosilicic acid solution in accordance with the following table:

Sheet Thickness, In.	*Immersion Time*
0.016 to 0.030	6 minutes
0.031 to 0.064	8 to 10 minutes

(*d*) Thoroughly rinse parts in cold running water.

(e) Dry parts in hot-air drying tank using a hot-air blast.

3. Cleaning of All Heavily Soiled Parts:

(*a*) Clean parts in vapor degreaser.

(*b*) Follow procedure for cleaning of parts lightly soiled.

D. Solutions:

1. Alkaline cleaner (KDL-1):

(*a*) The solution shall be prepared by using 4 ounces of KDL No. 1 per gallon of water.

(*b*) Solution shall be checked by the process engineering laboratory and their recommendations for additions or replacements shall be observed.

(*c*) The operating range of the solution shall be 180 to 200 F.

2. Hot-water Rinse:

(*a*) Maintain solution at 180 to 200 F.

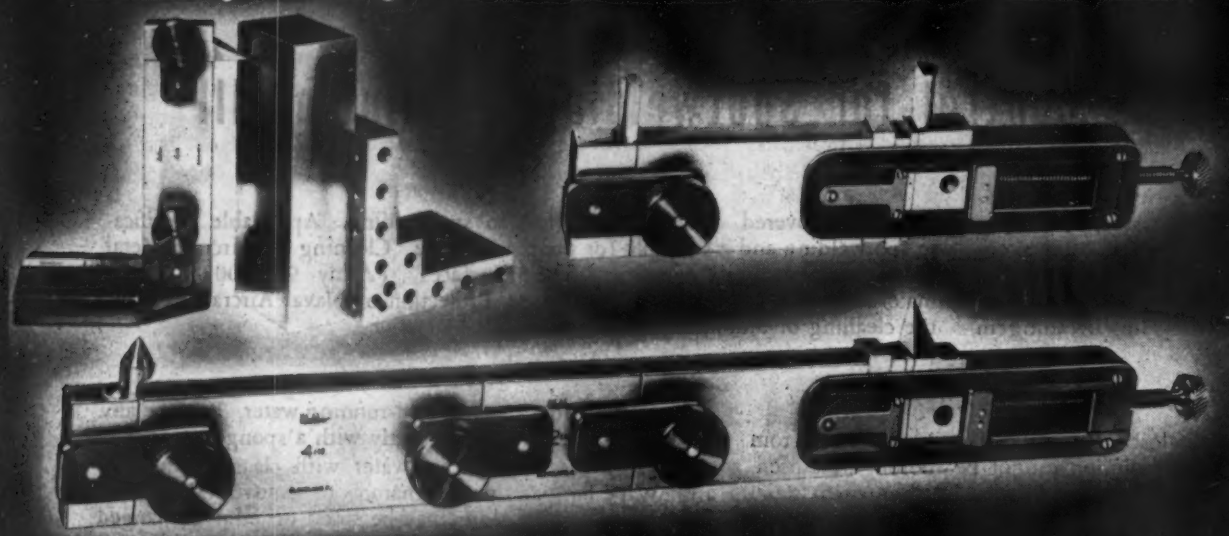
(*b*) Intake and outlet connections shall be such as to provide for a complete water change every half hour.

(*c*) The rinse tanks shall be kept free of foreign material and shall be emptied at least once every two weeks or more often if necessary and thoroughly cleaned.

3. Nitric-Acid Solution:

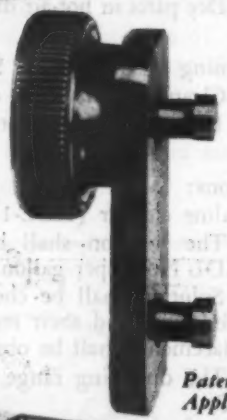
(*a*) The concentration of the solution shall be maintained between 48 to 52 percent by volume of 42 deg. Baume nitric acid.

WEBBER
Heavy Duty GAGE BLOCKS

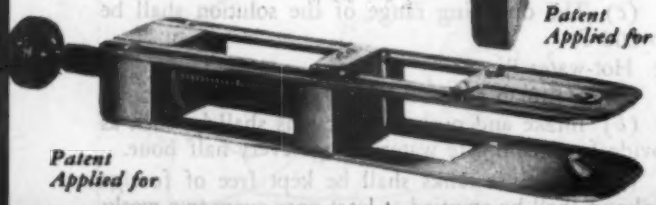


Right—Webber Eccentric Clamp used to unite several blocks quickly into one solid, accurate gage.

Below—Webber Quick Acting Gage Clamp snaps onto the end of any of the long blocks and firmly holds any other blocks necessary to make up the fractions of an inch. Only one of these is required with each set.



Patent Applied for



Patent Applied for

● A handy, complete set of blocks and clamps for making precision measurements up to 36 inches. Additional blocks and clamps available for increasing capacity.

With this set everything you need is in the set. There are no loose pins, screws or small parts which take time to assemble and are easily lost.

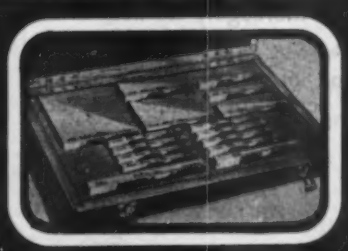
The Webber Eccentric Clamp and the Quick Acting Gage Clamp permit quick, easy assembly of blocks into a unit of precision measurement. There is positively no change in dimension due to clamping action.

Webber offers two Heavy Duty Gage Sets—

No. 24 Range from .300" to 24.000" in steps of .0001"

No. 36 Range from .300" to 36.000" in steps of .0001"

Write today for bulletin illustrating and describing this compact, useful set of gages for precision measuring.



Webber
GAGE COMPANY

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Process Control for Spotwelding Aluminum—IV

(*b*) Preparation of Solution:

(1) Partially fill the container with tap water.

(2) Add the acid slowly to water, constantly stirring with wooden paddles. Use 50 gallons of 42 deg. Baume nitric acid for every 100 gallons of solution.

(3) Special care shall be exercised in adding acid to water to avoid spattering.

(4) Never add water to acid.

4. Cold-Water Rinse:

(*a*) Maintain solution at room temperature.

(*b*) Intake and outlet connections shall be such as to provide for a complete water change every half hour.

(*c*) The rinse tank shall be kept free of foreign material and shall be emptied at least once every two weeks or more often if necessary and thoroughly cleaned.

5. Oakite No. 30:

(*a*) The solution shall be prepared by using 6 ounces of Oakite No. 30 per gallon of water.

(*b*) Solution shall be checked by the process engineering laboratory and their recommendations for additions or replacements shall be observed.

(*c*) The operating range of the solution shall be between 190 to 200 F.

6. Hydrofluosilicic Acid:

(*a*) Hydrofluosilicic acid solution: 3 percent by volume of 27 to 30 percent hydrofluosilicic acid (H_2SiF6) and 0.1 percent by weight of Nacconal NR in water. For a single gallon of solution, equivalent amounts are 0.03 gallons of 27-30 percent hydrofluosilicic acid and 0.13472 oz. of Nacconal NR plus water. Method of preparation is:

(1) Partially fill the container with tap water.

(2) Add the acids slowly, constantly stirring with wooden paddles.

(3) Special care shall be exercised in adding the acids to the water to avoid spattering.

(4) Never add water to the acid.

(*b*) The solution shall be maintained at room temperature.

(*c*) Solution shall be checked by the process engineering laboratory and their recommendations for additions or replacements shall be observed.

E. Handling:

Avoid soiling parts during handling and assembly operations prior to spotwelding. If necessary, wipe faying surfaces with clean cloth prior to spotwelding.

F. Dating:

All aluminum parts shall be dated by the production department immediately after the cleaning procedure. An indelible ink stamp is to be used. The date shall be stamped in a conspicuous spot on the part but not on a surface to be welded. The solution cleaning operation shall be done so that parts shall be spotwelded within three days after cleaning.

G. Recleaning:

1. Alclad parts originally cleaned in hydrofluosilicic acid solution and not spotwelded within three days, or which become dusty or soiled by handling, shall be recleaned as indicated in paragraph C(2), wire brushed or cleaned with emery cloth.

2. Non-Alclad parts originally cleaned in Oakite No. 30 solution and not spotwelded within three days, or which become dusty or soiled by handling, shall be recleaned as indicated in paragraph C(1), using an Oakite No. 30 dip time of 1.5 min., or wire brushed, or cleaned with emery cloth.

H. Assembly Cleaning:

Alclad assemblies may be cleaned as indicated in paragraph C(2) if the faying surfaces are separated by wood wedges. The dip time shall correspond to that for the thickest sheet for unequal combinations.

I. Precautions:

1. Operator must wear rubber gloves and goggles, particularly when working with acid solutions.

2. Nitric Acid:

(*a*) If parts of the operator's body or clothing come in contact with acid, wipe off gently, immediately flood parts with water, using soap freely and then cover with baking soda.

(*b*) A supply of soap and baking soda shall always be kept on hand near the nitric-acid tank.

3. Hydrofluosilicic Acid:

(*a*) If parts of the operator's body or clothing come in contact with acid, wipe off gently, immediately flood parts with water, using soap freely and then cover with baking soda.

(*b*) Rinse off baking soda with water after five minutes and apply oil.

(*c*) A supply of soap, baking soda and oil shall always be kept on hand near the hydrofluosilicic acid tank.

4. Notify the dispensary immediately after treatment.

J. Control:

1. The process and materials chemical laboratory will supervise solution strength maintenance by weekly analyses. Samples submitted for analysis must be from a full tank.

2. Report problems encountered in operation or maintenance to the process engineering department.

3. Control of quality shall be the responsibility of the operator, the foreman, the inspector, the quality manager, and the process engineering department in the order named.

Manufacturers of the proprietary compounds used by Fleetwings for cleaning purposes are KDL No. 1 aluminum cleaner—Kelite Products Company, New York; Nacconal NR-National Aniline & Chemical Company, Philadelphia; Oakite No. 30-Oakite Products, Inc., New York.

Future installments will cover spotwelding control and inspection.

AMPCO

TOOLS

OUR EMPLOYEES ARE SINCERELY PROUD OF ONE OF THEIR OUTSTANDING CONTRIBUTIONS TO THE WAR EFFORT . . . IT IS THAT OF CONTINUED PROGRESSIVE IMPROVEMENT IN THE QUALITY OF AMPCO TOOLS WHICH FOR YEARS HAS BEEN SO WELL RECOGNIZED BY HIGH PRODUCTION PLANTS IN THE METAL WORKING INDUSTRIES.

AMPCO TWIST DRILL CO.

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Munition Program Rearranged

The prolonging of the European War has brought inevitable rearrangements in our armament program. Pressure has intensified on existing bottlenecks in such items as trucks, heavy tires, heavy artillery and ammunition, supply ships and naval ammunition. Moreover, new program increases are on the way. On November 24th, the government announced the doubling of the small arms ammunition program, requiring an additional 62,000 workers. Meanwhile, military observers expect that a large program for jet planes may be decided on in the near future, further complicating the military production picture. At the same time, swift Allied progress in the Pacific is upping needs for naval projectiles and rockets, as well as spare parts to repair damaged ships.

This means the government may have to move more swiftly in curtailing production of less badly needed items, and begin drawing down stockpiles. Two more government-owned magnesium plants have been shut down, bringing the total to nine plants, while another unit's operations are being reduced. Further cuts in aluminum may be expected, and insiders say that the maritime program will be reduced within the next few months.

Tackling the Bottlenecks

Krug's plan to handle bottlenecked plants one by one is expected to eliminate some of the trouble spots. In addition, the government will schedule the use to which certain types of castings may be put to assure that they will be diverted to critical production. Special British tools brought to the U.S. will speed up the expansion of production lines turning out heavy ammunition. Meanwhile, a new heavy-duty axle plant at Madison, Illinois, should help relieve the axle shortage. But shifting needs for special types of labor will be more difficult to solve. The War Manpower Commission's tough job is well illustrated by the Ohio telephone strike, where Dayton operators struck against payment of living expenses to operators brought into the area. As long as there is no national service act, such incentives have been regarded as the only means of getting needed manpower to the critical areas. But when labor unions refuse to accept this practice, the step is automatically killed. Labor opposition has also halted application of wage incentives to solve production lags.

On the favorable side was the War Labor Board's refusal to break the "Little Steel" wage formula, which might have upset labor conditions throughout the country and touched off inflation. Meanwhile, the CIO at its annual convention in Chicago renewed its no-strike pledge; while CIO union members were out on strike at Allegheny Ludlum's Watervliet plant, at Wheeling Steel's Portsmouth works, and at Carnegie-Illinois' Gary works. The CIO claimed 6,000,000 members, including 1,300,000 in the armed forces. The AFL, in convention at New Orleans, reported a membership of 6,818,400.

Reconversion Slowed Down

Although WPB's Krug prevented the killing of the spot authorization plan, new permissions for civilian productions are expected to be few and far in between. As it is, many spot authorizations had been denounced as "rubber checks" in recent weeks. After securing WPB's permission, many manufacturers found OPA prices preventing them from producing civilian goods at a profit, or they might often be unable to secure component parts. Thus, government announcements on the amount of civilian production authorized (suspended since November 7th) did not mean very much.

But reconversion planning has also hit snags. Government VE-Day plans, based upon study of the Army Supply Program, are hampered by the fact that it takes about a month to gather and prepare such data, so that by the time WPB works on it, the information is stale. That explains the conflicting reports on whether VE-Day cut-backs will be 20 percent or 40 percent. As it is, the latest change in the munitions program will upset previous estimates that much more.

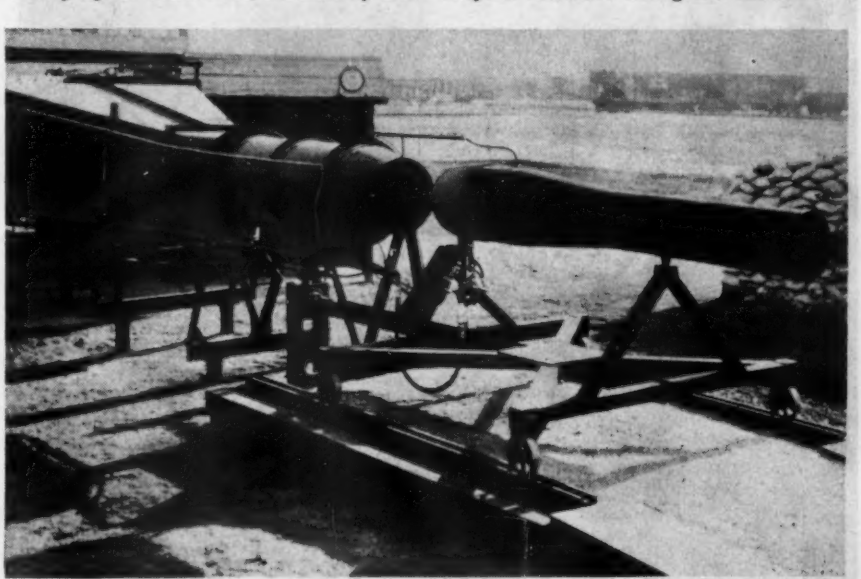
Tool Situation Gloomy

The chances for the auto and other industries to secure reconversion tools have taken a set-back as a result of increasing military orders. The tool industry's new orders in October (including $17,151,400 in unrated orders) increased $23,053,000, whereas shipments for that month rose only $1,224,000. As a result, the industry's backlog increased to $213,392,000 from September's $194,125,000. Cancellations for October at $3,644,000 showed little change from September's $3,960,000.

At the end of October, the tool industry had $25,716,000 in unrated orders on its books. But the difficult position of unrated orders is indicated by the fact that only $421,100 of October's total shipments of $37,113,000 consisted of unrated orders, as against $21,100 in unrated shipments out of September's total of $35,889,000. October's new orders totaled $60,165,000 including $17,151,400 in unrated orders, as compared with September's $37,112,000 order volume of which $7,862,400 consisted of unrated business.

Detroit Cutting Tools

The Army is reported to have declared surplus some 700,000 cutting tools in the Detroit area. Originally valued at $3,000,000, these tools are expected to bring much lower prices, since they are special purpose tools. Buyers will have to regrind the tools.



Press Association

Ford Robot Engine—A jet-propulsion robot bomb engine built by the Ford Motor Co. for the Army Air Force is being tested at the mouth of a wind tunnel. The tunnel is capable of expelling air at 400 miles per hour to equalize engine speeds

War Production Bottleneck Causes Outlined by WPB Chief Krug

Large program step-ups rated as major factor, with design changes, labor, and facilities ranking in lesser importance. War output 40 percent behind

WASHINGTON—In the judgment of Army, Navy, and War Manpower Commission officials, step-ups in various war program are declared to be accounting for 40 percent of the lags in critical programs, according to a War Production Board study outlined by J. A. Krug, WPB Chairman, before the National Press Club on November 21, 1944. Design changes are responsible for a bit more than one-quarter of the war output deficiency, labor shortages are a slightly less important factor, while facilities bottlenecks accounts for one-eight of the total lag.

40 Percent Behind

Krug stated that on an over-all basis, about 60 percent of the war production program is on schedule, while 40 percent is behind requirements. He explained that the critical heavy truck and tire program were complicated by the fact that heavy roads and hard usage had multiplied previously set requirements. (It is reported that October's truck output was 18 percent behind schedule, while the heavy tire production was 35 percent behind requirements.) Mr. Krug stated that increased consumption of heavy ammunition has required a doubling of the program from a monthly output of $45,000,000 to $100,000,000, and that this called for hundreds of special purpose tools and new production lines. (Against this stepped-up program compares the report that heavy ammunition production in October was only three percent above September.)

Reconversion not at Fault

Krug stated he did not share some fears that reconversion planning "will result in a slackening of our war production effort." However, he predicted that the Army, Navy and WPB would shortly issue a joint statement on spot authorization policies. Such statement would specifically forbid authorization of nonessential production requiring certain skilled labor in any area where war production was lagging due to shortages of such labor, while authorizations would be granted in areas where war production was on schedule.

Other Washington sources attributed lags in Navy ammunition, truck and tire output to both program step-ups and facilities shortages, while attempts to lift tank and radar production were hampered by design changes, and labor shortages were interfering with the building of supply and ammunition ships. This same latter factor is reported to be slowing up repair work on fleet units on the West Coast.

Frontline Ordnance Experts Repair Tanks In Record Time

WITH THE SIXTH ARMORED DIVISION IN FRANCE—Ordnance men of a Maintenance Battalion of this Division have within 24 hours evacuated, repaired and delivered ready for action combat vehicles whose crews had been killed by enemy artillery. Such miracles have become commonplace for salvage and service crews commanded by Major Raymond B. Graeves, Jr., and they have successfully recovered and repaired almost 100 percent of disabled vehicles.

In the first two-and-a-half months of the Sixth Divisions' operations in France, these crews returned 1050 damaged vehicles to action. Of these, 543 were combat vehicles, 156 of which had been disabled by enemy fire, while 616 were general purpose vehicles, of which 230 had been damaged by enemy fire. During the same period, they repaired 164 pieces of artillery, reclaimed 2000 small arms weapons, repaired 700 instruments, and had done 1000 miscellaneous other jobs.

With more than 3200 vehicles under division control, the Sixth spearheaded the Allied Drive in over-running the Brittany Peninsula, covering a distance of 350 miles in ten days. In the next five weeks, the division went 750 additional miles in swift combat movement. This accomplishment would have been impossible without effective maintenance of light and medium tanks, half tracks, scout cars, self-propelled artillery, and small arms and instruments.

Tank repairs are made on the spot wherever possible to avoid the time-taking evacuation of the vehicle from the field of combat. Evacuation of damaged tanks is acomplished with the help of a recovery vehicle, which is an M-4 Tank with wrecking boom attached. At the battalion shop, shell holes are plugged by welding. Damaged final drive and transmission units often require removal of the entire power train assembly and its armor, a total weight of six tons, before repairs can be made. But the close work on intricate machinery, guns and fire control apparatus inside the tank is both complicated and back-breaking.

Front-Line Ordnance Shop—Removal of a 105mm Howitzer from an M-4 medium tank is being inspected by Major General Robert W. Grow, kneeling on tank, at an Ordnance Shop near the front

Wartime Washington

60 Million Job Plans

Roosevelt's campaign pledge for "60,000,000 jobs" after the war was apparently based upon a specific Administration plan, part of which has leaked out from White House sources in recent weeks. These reports envisage: (1) a large Federal housing program, incorporating a continuation of slum clearance; (2) seven TVAs for the nation's watersheds, running into billions of dollars and requiring hundreds of thousands of workers; and (3) maintenance of foreign trade at a $15,000,000,000 level, largely through U.S. loans enabling the lenders to buy.

Already the American public is being groomed on the theory that the United States must financially put the world on its feet. A high postwar volume of foreign trade is being held out as the attractive prospect for an extension of American financial aid abroad. But the cost of these ideas is beginning to worry financial experts who now fear that present tax levels could not be reduced materially even if the postwar budget were only balanced.

Spots Almost Killed

The "Spot Authorization" program had a narrow escape a few weeks ago. Director of War Mobilization Byrnes was ready to call the spots off because of continued manpower shortages and lagging war production. Leaders of various agencies were called to the White House, including WPB Director Krug, who arrived armed with careful studies of each of the bottleneck programs showing manpower was not the only cause of production trouble. Program increases and design changes ranked as the two most important difficulties in that order, with labor shortages third and facilities bottlenecks fourth. Thus, even if all required manpower were available, bottlenecks would continue to exist. Result: spots were given another try.

But Krug didn't stop there. To justify his convictions that bottlenecks could be broken without interrupting the "spot" program, he and leading aids immediately left for visits to troubled plants in Chicago, Cleveland, and Detroit, to gather first-hand information and take immediate action whenever possible. For example, a forge shop operator explained that lack of proper housing was causing him to lose many employees who had been imported from the South, and that he could check the exodus if he could get a few hundred trailers to house his workers during the cold weather. On the spot, he was promised the few hundred trailers he said he needed.

An artillery manufacturer said that lack of certain key machine tools was impairing his expanded production program. WPB promised to apply pressure to secure the tools either out of existing government-owned supplies or from the manufacturers. In the tire plants, it was discovered that besides manpower, conveyor lines were inadequate for heavy tire schedules.

Army More Cooperative

Although the Army has been reported as the major opponent of the spot program, it is said that its differences with WPB have been patched up largely on the basis of WPB's report on bottlenecks. Moreover, the Army has agreed to inform WPB promptly of new requirements that come in from the field, instead of following its former practice of first studying the requirements, preparing a program for them, and then presenting it to WPB much later on.

Arsenal Equipment Upgraded

The Army has been clearing its arsenals of old equipment, and plans to replace everything over five years old. The Navy is also upgrading its installations, but has no set limit for the age of remaining equipment.

The Surplus War Property Administration's plan to have cutting tool manufacturers handle sales of surplus government-owned cutting tools on a commission basis is still in the hands of the Attorney General. Since he has 90 days to make a decision on this plan, it is expected that he will take the full amount of time allowed and not make a decision until late January.

Resignations Stymied

The President's action in coaxing Byrnes and Crowley to stay on the job at least until after VE-Day was motivated by the same reasons that led him to refuse to accept the resignations of the public members of the War Labor Board, i.e., the President felt that a general exodus by top government officials would certainly not go well with government appeals to war workers to stay on their jobs. It is therefore expected that planned changes in certain top government posts will also be deferred until VE-Day. Sole exception is the case of Secretary Hull, whose illness forced his replacement by Stettinius.

Meanwhile, busy Donald H. Nelson was given a new cabinet post, and is expected to spend most of his time stimulating foreign trade. The President moved to fill the three new jobs in the Surplus Property Board by nominating lame-duck Senator Guy M. Gillette, Lt. Col. Edward Heller, and the defeated gubernatorial candidate for Connecticut, Robert A. Hurley. The insinuation of politics into these posts was not surprising to Washington observers, who had previously felt that it would be too sensible to appoint such men as Mason Britton of the Surplus War Property Administration, Sam H. Husbands of the RFC, and Col. Joseph P. Lockwood of the Surplus Property Administration.

BRITISH LEND-LEASE TOOL DEAL NEAR COMPLETION

WASHINGTON—Arrangements for the sale of American lend-lease tools now in Britain are reported to be nearing completion. Agreement between the British and the United States is said to have been reached on the matter of prices, which will be set near to levels for British machines, which normally sell at lower prices than American machines. Since American representatives were stated to be seeking a cash settlement, it is likely that the terms of the sale will be for cash. This will forestall the British returning the tools to this country, and at the same time enable the British government to resell the tools to English manufacturers at reasonable prices.

Lend-Lease Jeep—Parts of an American lend-lease jeep are shown being carried by coolies over a Chinese mountain toward the Burma Road, where the vehicle will be reassembled. This offers an idea of the effect of the cutting of the Burma Road upon the flow of aid to China

Press Association

Tools for Heavy Ammunition Program Declared Most Critical

Chafee predicts scheduling of bottleneck components at Tool Distributors' meeting. E-l-b to remain in effect after VE-Day. Einig elected president

HOT SPRINGS—The most important tool program right now is the required equipment for heavy ammunition production lines, according to John S. Chafee, Chief, Tools Division, War Production Board, in a speech delivered before the Annual Meeting of the American Machine Tool Distributors Association, held here on November 13th. Mr. Chafee said in addition to machine tools, this program required presses, heat-treating equipment, shot blast equipment, marking machines and cranes.

He added that scheduling of bottleneck components, such as motors, pumps, bearings, and so on, was planned. He warned that new rated orders might force the setting aside of unrated tool orders, and cautioned the industry to watch its delivery dates and not to oversell on the basis of early deliveries. Although all Russian orders are rated, he stated that little new export war business is expected. The amount of tools involved in the Fourth Russian Protocol for the 12 months ending June 30, 1945, was declared to have roughly equalled the amount for the Third Protocol.

Pool Orders Declining

Preference Order E-l-b will be retained in effect after VE-Day, according to Mr. Chafee. He revealed that pool orders are declining, and that fewer than 1600 machines are unassigned at present. Most WPB staff members working on redistribution in the Tools Division have been transferred to the DPC to aid the government in liquidating its surplus tools. This development and other staff reductions have cut the size of the Division's staff down to a hundred people.

Other speakers at the meeting included Brigadier General Frederick M. Hopkins, Jr., Army Air Force, who spoke of the tool industry's contribution to the plane program; and Paul Wooton, Chief, Washington Bureau, McGraw-Hill Publishing Company.

New Officers Elected

Officers elected at the meeting to serve for the ensuing year include: President, A. B. Einig, Motch & Merryweather Machinery, Cleveland, Ohio; Vice-President, George Habicht, Jr., Marshall & Huschart Machinery Company, Chicago, Illinois; Second Vice-President, D. N. Macconel, Machinery Sales Company, Los Angeles, California; Secretary-Treasurer, C. C. Brogan, W. E. Shipley Machinery Company, Philadelphia, Pennsylvania. Members of the Executive Committee to serve until 1947 include Joseph F. Owens, J. F. Owens Machinery Co., Syracuse, New York, John E. Livingstone, John E. Livingstone Company, Detroit, Michigan, and Bert L. Sylar, Bert L. Sylar & Son, Chattanooga, Tenn.

Truck Bookings Down

CHICAGO—September, 1944 bookings of electrical trucks and tractors at 200 units were down from the August total, according to the Industrial Truck Statistical Association. The net value of chasses of September bookings came to $825,360, as against $1,542,883 for August.

Steel Workers Get $66,500,000 Increase; No Basic Wage Boost

WASHINGTON—Although the major demand of the CIO steel workers for 17-cents-an-hour wage increase is still left up to President Roosevelt to decide, the War Labor Board has taken favorable action on five other union demands, expected to bring an average increase of five cents an hour to steel worker wages. It is estimated that these new concessions will cost the 86 basic steel companies involved $41,400,000 in shift premiums and $25,100,000 in vacation costs.

The board has ordered: (1) premium pay of four cents an hour for the first night shift and six cents an hour for the second night shift; (2) eliminating of intra-plant inequalities not to exceed five cents an hour; (3) dismissal pay; (4) liberalized vacations and holiday schedules; and (5) maintenance of membership and dues checkoff. The board also said that it would approve sick leave and insurance plans, but did not order steel companies to grant these benefits.

Annual Wage Denied

The board refused to order group insurance, a fund for workers in the armed forces, elimination of geographical differences, and higher learners' rates. While the guaranteed annual wage was denied, the board recommended that the question be studied by a special presidential commission.

Irving S. Olds, chairman, U. S. Steel Corporation, said the public would have to pay for these increases in one way or another through: (1) higher prices for steel and its manufactured products; (2) higher income taxes to offset lower government receipts from taxes on the steel industry; or (3) fewer jobs resulting from the financial weakening of private enterprise.

Steel Formula to Hold

Meanwhile, observers here believe the President will deny the CIO's demand for a 17-cents-an-hour wage increase which would crack the "Little Steel" formula. Economic Stabilization Director Vinson indicated this when he pointed out that the Bureau of Labor Statistics' cost-of-living index had been supported by WLB's survey of the subject. Actual cost-of-living rise since January, 1941, has been estimated at 30 percent by a presidential committee, while average hourly steel earnings rose 43 percent, and average weekly steel earnings showed a 65 percent increase. The CIO's case is based upon the basic hourly rates, and does not consider benefits from upgrading of workers and overtime.

SWPC TO OFFER TRADE-IN PRIVILEGE ON TOOLS

WASHINGTON — Trade-in allowances on obsolete tools to be applied against the purchase price of government-owned surplus tools may be granted to small concerns by the Smaller War Plants Corp., it is reported. Although SWPC's tool program has not been entirely formulated as yet, it is stated that the trade-in policy will be accompanied by the setting up of a standard schedule for such allowances, along the lines of Will Clayton's pricing schedule for government-owned tools. This development would give SWPC a selling advantage over the RFC, who is charged with the overall selling job of tools and other capital equipment.

SWPC plans to then dispose of the turned-in machines, and expects to export some of them with the cooperation of FEA and lend-lease. Industry observers question that the export of such old machines will help American industry abroad, since they may give negative impressions of our tool-building ability. As it is, potential foreign buyers here do not seem to be interested in used tools at all.

Inside Detroit

Reconversion Shifts

Less publicized now in view of the current alarming lag in war production, reconversion preparations in this area are continuing without let-up. By now some semblance of order has actually been introduced into the pattern of machine tool and materials delivery schedules.

Steel orders for reconversion have already been placed in large numbers. Many are subject to gage or size change before entry; others are placed unconditionally. Although no exact tonnage figures are available on specific categories of steel being ordered, the consensus of opinion among steel company representatives here is that the orders (at least of the automotive industry) are divided between the various categories in the same proportion which prevailed before the war.

Delivery Promises Vary

Delivery promises are, of course, made for a specific length of time after VE-Day, ranging from as low as 30 days to four months or longer. Sheet metal and forgings will be among the first lines needed by automotive producers and, judging by the current unfortunate position of the forge shops, forging looms as one of the most probable bottlenecks.

The machine tool picture is becoming increasingly hazy as the divergences between the delivery positions of individual manufacturers continue to widen. In general, the outlook on plastics presses is decidedly more encouraging. For a time it had looked as if at least one automobile manufacturer might be caught without presses for a long time after VE-Day. Now the need will apparently be filled.

Press Backlog Mounting

Delivery promises on various classes of metal-working presses, however, have fallen back from four or five months to somewhere between five and seven. And the backlog of orders is piling continually higher.

The most marked divergences in the relative delivery positions of machine tool manufacturers occur in widely used standard lines. To begin with, there is the small number of manufacturers who did not become involved in government contracts and consequently, can make immediate deliveries on any standard type of machine.

Chief worry of these companies in the past few weeks has been the fact that the government has been filling more and more of the incoming orders for machine tools from its own lists of surplus equipment, thus sharply reducing the manufacturers' volume of business. Among the companies seriously affected by this trend, the competition is actually alarming to some, especially as there is every indication that worse is yet to come.

To a greater extent than ever before, this pessimism seems to have pervaded the entire industry. It is shared even—ironically enough—by companies whose order backlogs make their delivery position appear almost hopeless.

Tool Industry Squeezed

In other words, the machine tool industry is apparently caught between two fires. On the one hand, government competition is eliminating potential new orders; on the other, component and manpower shortages are limiting the industry's ability to make delivery on orders already entered—particularly in plants tied up with contracts for some variety of war production which bears no resemblance to machine tool manufacture.

The district representatives of some leading machine tool companies are actually functioning unofficialy as purchasing agents for old customers—appraising and buying government tools for them. Most of their time in the past few weeks has been divided between this work and providing routine servicing and demonstration of machines moved from plant to plant.

Components A Handicap

As for component shortages, the pattern is just as lacking in uniformity as the rest of the machine tool picture. For the most part, the pump shortage seems to be clearing up. Electric motors are the number one stumbling block for most manufacturers—especially five horsepower, and similar motors. Even here, however, fifteen and twenty weeks is the prevailing range of delivery promises on such motors, and to many manufacturers that is ample time, inasmuch as other shortages prevent their needing motors before then. It also claimed in some circles that the principle cause for the motor shortages facing many companies is their failure to line up their sources in advance and hold them in line with something more than vague assurances of future orders.

Among other short items hampering reconversion machine tool production, bearings and chains are apparently the most outstanding. There are also machine tool manufacturers still looking for foundry capacity to cast beds. For this group, the prospect is indeed dismal as foundry capacity in the Detroit area today is rarer than manpower and butter. Manufacturers who have their own foundries have a distinct advantage in this respect.

Gasoline Drum—This 21-pound aluminum drum will be used by the Air Transport Command to supply gasoline to the Air Forces fighting in the China-Burma-India theater. The drum halves are tack welded together before final joining by torch welding

NWLB Rules Women Workers Are Entitled to Equal Pay

CLEVELAND—When scientific job evaluation has determined that the work is equal, women are entitled to the same pay as men, the National War Labor Board has ruled.

The board last week upheld a ruling of the Fifth Regional Board which wiped out pay differentials at the Union Screw & Bolt Co., Cleveland. An engineering firm which classified the jobs took cognizance of the limitations of women workers and gave them lower "point ratings" which automatically result in a lower wage. "To further discount these factors in the form of a lower wage rate . . . would be equivalent to 'pyramiding a detriment,'" the board held.

Spotting the Air News

Lend-Lease Plane Disposal

Despite the progress reported between the United States and Great Britain in arranging for sale of lend-lease machine tools to the British, it is likely that other lend-lease items will be more of a problem. Postwar disposal of many American products shipped abroad will pose serious questions, and it is likely that plane disposal may prove the most difficult job.

Most lend-lease goods are expendible: foods, clothing, combat planes, etc. But many warplanes lend-leased to England, Russia, and others will be in good condition when the war ends. North American P-51s, for example, though they be nearly new, will have little or no value to the British, or to us. As yet there is no plan on what to do with such equipment. Even older, worn-out aircraft, and other war machinery, ready for the scrap heap, will be a problem. The Army recently demonstrated that the labor cost of dismembering an airplane for scrap is more than its scrap value. The cost of space probably will preclude shipment home of aircraft in either good or junk condition. Congress has sensed already that the public, having paid a lot of money for airplanes, doesn't want to burn them or sink them in the sea. In fact, expected testimony by experts on the war depletion of metals sources will make scrap-piling a live issue.

Postwar Models Offered

A half dozen major transport plane manufacturers have postwar designs, some in the air and some on paper, which they want to sell to the airlines, here and abroad. So far one, Douglas, has taken practically all the orders. Martin, Boeing, Curtiss-Wright, Lockheed, Consolidated, Fairchild and others have marked up no sales or comparatively small ones. Any one of the major companies could easily build all the transport planes that will be needed in the entire world in immediate years. Most or all of these companies are building expensive prototypes for demonstration. If these major producers get sufficient military orders after the war to keep them going, they can each build small numbers of commercial aircraft. If not, pressure for minimum cost will force volume production by a very few companies. The airlines themselves may tend toward standardization on a few types, for lower purchase cost, and low maintenance and crew training costs.

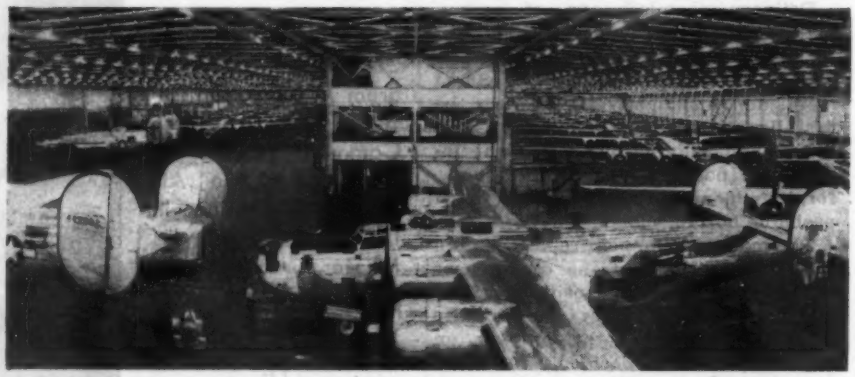
Prefabricated Housing Plans

Beech Aircraft, of Wichita, has announced a joint project with Dymaxion Dwelling Machines, Inc., International Association of Machinists (AFL), to produce the Dymaxion house. The Company concluded that ordinary prefabricated houses are not adaptable to production by aircraft methods and facilities, but that the Dymaxion "dwelling machine" is. It requires only one quarter of the space used in shipping the materials of conventional houses, and one half that of the ordinary prefabricated house. Only a few hours are needed to assemble it, foundation and all, for occupancy. Beech will continue to build airplanes. There has been much discussion about the convertibility of aircraft plants to non-aviation productions. Beech offers one possible solution.

Weight of 1945 Plane Output To Equal 1944 Total—Knudsen

LOS ANGELES—The poundage of the 1945 airplane program will be as great or greater than that of 1944, despite a projected 25 percent reduction in number of ships, according to Lt. Gen. William S. Knudsen on a visit to the Coast. Knudsen said, "We must double production of B-29s in the next three months." He stated that the B-29 and Consolidated's B-32, a similar heavy bomber now in production but not yet reported in action, are needed to "smash Japan." Almost concurrently, Boeing announced that all of its facilities not now being so used will be converted to B-29 production as soon as possible.

Meanwhile, strenuous efforts to speed up completion of a group of attack transports being built for the Navy were indicated by an announcement by the California Shipbuilding Corporation that five such ships built in the Los Angeles Harbor yard would be sent to Vancouver, Washington, for final outfitting. Four other ships recently launched by Calship are being outfitted at docks available in Oakland. This move to "pool" facilities is the latest in a series of expedients adopted by shipbuilders here to minimize the effect of labor shortages.



Twin Assembly Lines—Giant bombers being turned out by the hundreds every month at the Ford Willow Run plant are shown rolling off twin assembly lines. The planes in the foreground will be serviced and fueled and then go to the flight apron for their maiden flights

Screw Thread Standardization Progress Reported By CPRB

NEW YORK — American engineers were urged to support unification of American, Canadian, and British screw threads at a special meeting held here on November 16th under the sponsorship of the American Standards Association. Before members of the ASA, SAE, and ASME, considerable progress toward the establishment of international standards for screw threads for these three nations was reported as an outgrowth of CPRB-sponsored conferences. It was pointed out that different specifications on screw threads between the three nations had lifted war costs by $100,000,000, besides delaying production and repair of war goods.

Because identical war items made in the United States and Great Britain were fitted together by different screw threads, lack of interchangeability greatly increased replacement and stocking problems, according to William L. Batt, deputy member of the Combined Production and Resources Board. Mr. Batt pointed out that the emergency forced U.S. Army engineers to adopt a compromise thread between the British Whitworth thread and the the American Sellers thread.

This thread was designated as the truncated Whitworth thread, having round roots and flat tops (see AMERICAN MACHINIST, Nov. 23, 1944, p. 106). But Mr. Batt emphasized that this led many engineers and government officials on both sides of the ocean to express the hope for further unification of screw threads. This resulted in CPRB's invitation to Britain to dispatch a mission of experts to the United States, which was done in November 1943, and in the later sending of an American mission to London in August, 1944. A detailed report by the mission, now returned, has been published by the CPRB, and copies are available from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Standards for Exports

In his introductory remarks, R. M. Gates, president, American Society of Mechanical Engineers, pointed out the great need for more standardization for better servicing of customers in the export field. This would overcome the present handicaps that American items, such as taps and dies, face in the foreign market.

The chairman of the U. S.-Canadian mission, Elmer J. Bryant, Director of Research of Greenfield Tap and Die Corporation, had high praise for British cooperation in the discussions. He pointed out that an agreement has been reached on buttress threads, and that a draft has been prepared for approval. In addition, progress was reported on a standard for instrument screw threads, specifications are being prepared on an agreement reached on screw threads for pipe cylinders, and standards for acme threads and cylindrical fits had been sent to London. Mr. Bryant revealed that discussion on design and drafting practice brought out that the British had recently developed a code of practice and simplification methods for using symbols on drawings to indicate position, concentricity, and symmetry tolerances; and that C. A. Gladman, of England's National Physical Laboratory, who helped develop this practice would read a paper on the subject before the Society of Automotive Engineers in January.

To Publish Specifications

Mr. James G. Morrow, vice-chairman of the mission, and metallurgical engineer for the Steel Company of Canada, Limited, urged continuation of this work on screw threads and that it be extended in other directions. He said that all three nations would publish specifications on agreed standards as official, and urge their usage to reduce interchangeability difficulty.

Paul J. Des Jardine, chief engineer, Small Tools Department, Pratt & Whitney Division, of Niles-Bement-Pond, stated that a new standard acme thread was near completion. Frank E. Richardson, senior engineer of the Army Air Forces discussed instrument threads; Henry W. Bearse, chief, Division of Weights and Measures, National Bureau of Standards, summarized discussions on buttress threads; while Neil Petersen, chairman of the Canadian Screw Threads Committee and president of Canadian Acme Screw and Gear spoke on high-duty studs.

Names in the News

C. E. Bleicher

C. E. Bleicher, vice president and general manager of the DeSoto division of the Chrysler Corp. since 1937, has been named president and general manager of the division. At the same time, Byron C. Foy, who was president of DeSoto before entering the air service as a Lieutenant Colonel, has been named vice president and director of Chrysler Corp., resident in New York.

Frederick S. Blackall, Jr., president of the Taft-Pierce Mfg. Co., Woonsocket, R. I., has been elected president of the New England Council succeeding **Edward E. Chase** of Portland, Me.

Andrew R. Benedictus of Brussels, Belgium, has recently joined the engineering service of the Foreign Economic Administration in Washington. Mr. Benedictus has had 15 years experience in the machine tool and production engineering fields with two years on the Board of Economic Warfare. He will help shape production policies in connection with the metal working industry outside the United States.

George F. Farley

George L. Wiley

George F. Farley has been elected vice president in charge of sales of the Milwaukee Metal Spinning Co., Milwaukee, Wis. Mr. Farley will be responsible for all sales activity, product development and postwar planning.

George L. Wiley, who has been in the electric arc welding field for the past 26 years, has been named welding consultant for the Big Three Welding Equipment Co., Houston, Texas.

A. Stull Harris, son of the founder of Harris-Seybold-Potter Co., Cleveland, Ohio, has been named president of that firm to succeed **R. V. Mitchell,** who has been elected chairman of the board of the concern. At the same time, **George S. Dively,** former secretary and treasurer, has been named vice president and general manager.

Thread Standardization Discussion Leaders—Discussion leaders at the November 16th meeting, held under the auspices of the ASA, ASME, and SAE, to receive the report of the U. S.-Canadian Screw Thread Mission to London. From left to right: Chairman of the meeting R. W. Gates, president of ASME; W. L. Batt, vice-chairman of War Production Board; Elmer J. Bryant, Chairman U. S.-Canadian Screw Thread Mission; James W. Morrow, vice-chairman, U. S.-Canadian Screw Thread Mission

George S. Eaton

George S. Eaton, of Lakewood, Ohio has been named executive secretary of the National Tool and Die Manufacturers Association. Mr. Eaton was for 20 months a member of the War Production Board's Aluminum and Magnesium Division Forging Section. Since last February he has been chief of the WPB Forging Section. Prior to joining the WPB, Mr. Eaton was associate manager of the Associated Industries of Cleveland.

James W. Corey, sales vice president since 1940 of The Reliance Electric & Engineering Co., Cleveland, Ohio, has been elected president to succeed **Clarence L. Collens,** who has been president for 37 years and who has been elected to the newly-created post of chairman of the board. Also, **H. M. Hitchcock,** senior vice president and treasurer, has resigned, effective the end of this year and **A. M. MacCutcheon,** engineering vice president, has been elected to fill his position as senior vice president.

John T. Gillespie, Jr., who has been a member of various government agencies in the past two and one-half years while on leave of absence from the Air Reduction Corp., New York, N. Y., has been appointed manager of export sales for the Watson-Stillman Co., Roselle, N. J.

D. C. Storms, formerly general superintendent of the St. Louis Ordnance Plant, has been appointed works manager of the East Alton plant of Western Cartridge Co. Mr. Storms has been with Western for 20 years in various capacities.

Ernest G. Jarvis, president of the Niagara Falls Smelting & Refining Corp., has been named chief metallurgist for Continental Industries, Inc., New York.

Kenneth McCreary has been elected to succeed the late **Frederick Goetze** as president of the Goetze Gasket & Packing Co., New Brunswick, N. J. Mr. McCreary has been associated with the company since 1932 and has served successively as assistant to the president, treasurer and vice president and treasurer.

R. W. Davis has been appointed general manager of the Allis-Chalmers Manufacturing Company's Norwood, Ohio, works. Mr. Davis was previously assistant manager of the Allis-Chalmers' electrical department in Milwaukee, but for the last two years has served on the War Production Board.

Lyman H. Bellows has been named sales manager of the Sheldon Machine Co., Inc., Chicago, Ill. He was formerly with the electrical tool division of the Stanley Works.

Martin J. Conway has been appointed manager, petroleum division of Lukens Steel Co. and its subsidiaries, By-Products Steel Corp. and Lukenweld, Inc. Mr. Conway has been with Lukens for almost 20 years and prior to that time was associated with other steel companies in United States and England.

Paul M. Mueller has joined the Blaw-Knox Co. as chief engineer in charge of development. For the past nine years, Mr. Mueller has been headquarters engineer for the Revere Brass & Copper Co.

J. H. Callan has been elected president of the Crucible Steel Co. of America. For the past six year, he has been a member of the board of directors and the executive committee.

BUSINESS ITEMS

Wheelco Instruments Co., Chicago, has appointed two new representatives—**John G. Davison,** Denver, in Colorado and **Olin Phillips,** Toledo, in northern Ohio—and the state of Minnesota has been added to the territory of **L. E. Cyrtmus,** Milwaukee.

The DeVilbiss Co. has moved its Cincinnati district sales offices to larger quarters at 410 American Bldg., Central Parkway and Walnut St.

Western Cartridge Co. and **Olin Corp.** both of East Alton, Ill., have agreed to merge as **Olin Industries, Inc.,** which will unify the management of 12 affiliates, subsidiaries and divisions of the two companies.

American Gas Furnace Co. has opened a new office in Milwaukee at 152 W. Wisconsin Ave. under the supervision of **George A. F. Machlet.** The Chicago office at 1370 Peoples Gas Bldg. has been taken over by **E. L. Milford** who succeeds **William J. Barenscheer,** retired.

Frank M. Bates, Inc., industrial consultants, have opened a New York office at 41 E. 42 St.

Celanese Corp. of America has changed its plastic products selling organization from **Celanese Celluloid Corp.** to **Celanese Plastics Corp.**

The Timken Roller Bearing Co., Ltd., Canadian subsidiary of **The Timken Roller Bearing Co.** of Canton, Ohio, will build a new bearing and rock bit plant at St. Thomas, Ont., as soon as arrangements can be completed.

The Boyé & Emmes Machine Tool Co., Cincinnati, Ohio, has appointed three new dealers in the following districts: **Jack Brewer,** Los Angeles, Calif.; **Schellenbach Machine & Tool Co.,** San Francisco, Calif.; and the **Sullivan Valve & Engineering Co.,** Butte, Mont.

The Tool Equipment Co., Chicago, Ill., has opened a new branch office in Rockford, Ill., at 419 W. State St., Room 110 in charge of **M. P. Hartnett.**

Briggs Clarifier Co. has appointed the following representatives: **M. N. Dannenbaum Co.,** 2409 Wayside Drive, Houston 12, Texas, in East Texas, and the Gulf Coast; and **McGregor & Werner, Inc.,** 1411 20 St. N. W., Washington, D.C. in Md., Del. and D.C.

OBITUARIES

Walter W. Mohr, 48, chief engineer of the Edward Valve & Mfg. Co. for 16 years, passed away Nov. 13 after an illness of several weeks. Mr. Mohr was the inventor of numerous types of valves, valve operating mechanisms and valve design improvements.

Walter B. Minch, 67, works manager of the McKeesport plant, Jones & Laughlin Steel Corp., Pittsburgh, Pa., died Nov. 8.

MEETINGS

American Management Association, Annual Personnel Meeting. Palmer House, Chicago, Ill. Feb. 14-16. J. O. Rice, 330 West 42 St., New York 18, N. Y.

American Society for Testing Materials, Spring Meeting. Hotel William Penn, Pittsburgh, Pa. Feb. 28. Robert J. Painter, Assistant to the Secretary, 260 So. Broad St., Philadelphia 2, Pa.

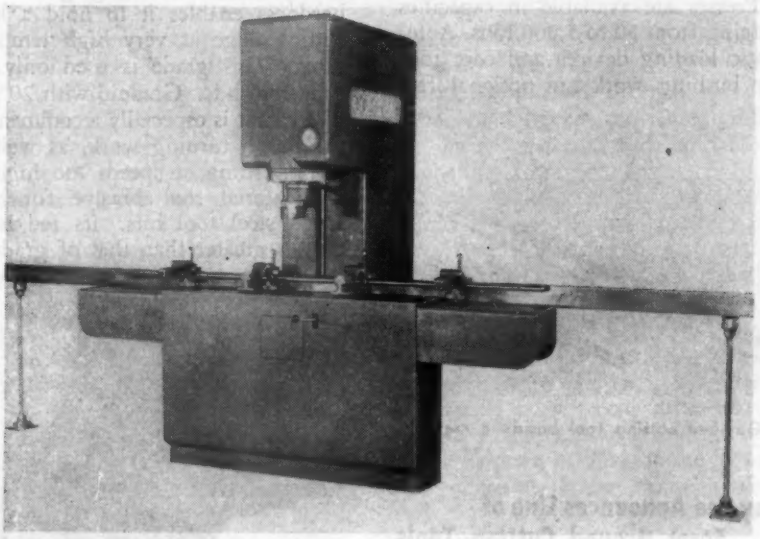
National Association of Manufacturers. Reconversion Congress of American Industry. Waldorf-Astoria Hotel. New York, N. Y. Dec. 6-8. Robert M. Gaylord, President, 14 West 49 St., New York 20, N. Y.

National Tool and Die Manufacturers Association. Hotel Schroeder, Milwaukee, Wis. Jan. 5-6. K. Jamiscewski, President, Superior Steel Products Corp., Milwaukee, Wis.

Society of Automotive Engineers. Annual Meeting. Book-Cadillac Hotel, Detroit, Mich. Jan. 8-12. John A. C. Warner, Secretary & General Manager, 29 West 39 St., New York, N. Y.

Shop Equipment News

Colonial Hydraulically Operated Straightening Presses Handle Both Finished and Rough Work



Colonial hydraulically operated straightening press

A line of hydraulically operated and accurately controllable straightening presses has been announced by Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich.

The machines are of rugged reinforced welded steel construction with built-in motor and direct acting hydraulic cylinder built into the head of the machine. Sensitive control is provided through light pressure hand control and foot pedals.

Straightening fixtures are equipped with either center or roller type work supports according to whether finished or rough work is to be straightened. These supports are mounted on a long guide rail through free action rollers.

The machines are available in capacities up to 50 tons.

Carboloy Produces Fine Steel Wire Dies of Grade 999 Carbide

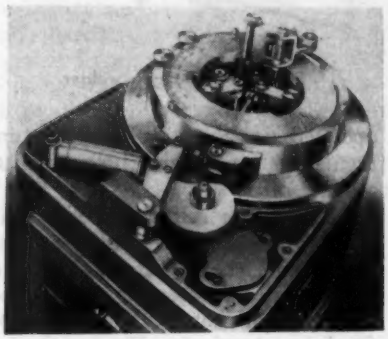
Extra-performance dies, Series R-1, specifically designed for the drawing of fine steel wire of approximately 0.015 in. dia. and under and made from Grade 999 cemented carbide, are now being carried as stock items at Carboloy Co., Inc., Detroit 32, Mich. This particular grade of carbide is the hardest metal produced by Carboloy.

The extreme hardness of these dies is said to make it possible to produce wire of greater uniformity and high surface finish over a longer run than other carbide dies.

Reed Cylindrical-Die Thread Roller Features Flexibility

The Reed Cylindrical-Die Thread Roller, Model 21, hand fed, manufactured by Rolled Thread Die Co., Worcester, Mass., is recommended for short miscellaneous runs as well as for continuous production of precision threads.

This machine is described as small, compact, easily operated and capable of handling a wide range of sizes, shapes, hardness and materials. Control of screw dimensions and matching are accomplished entirely by positive, graduated adjustments; there is no shimming. Hand operation during set-up is facilitated by a crank that replaces change gears.



Reed Cylindrical-Die thread roller

The combination of cylindrical dies, change gears and cam feed, all independently selected, permits almost limitless flexibility, allowing threads to be formed as quickly or as gradually as desired. Nominal range is ¼ to 1 in. dia. and up to 1½ in. length; under certain conditions, special tooling can be devised to extend this range.

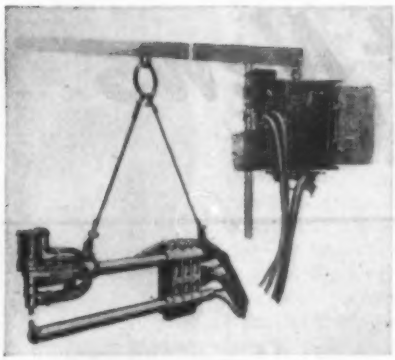
The entire mechanism is self-contained in a rugged, compact base, occupying only 28 × 35 in. of floor space, powered by a 2 hp., 1800 r.p.m. motor. Lubrication is by forced feed oil to spindle bearings.

Eisler Portable Gun Welder Goes to Inaccessible Spots

Eisler Engineering Co., 740-770 South 13 St., Newark 3, N. J., is manufacturing a new type of portable gun welder. It is a direct air operated welding machine, equipped with a double acting air cylinder and the necessary fully or semi-automatic operating mechanism.

The power part consists of an air cooled transformer, with an 8 tap switch for heat regulation, a pneumatic or electronic actuated timer and a high speed mechanical or electronic contactor for accurately timing the weld in speed or automatic repeat of strokes.

The air system includes solenoid



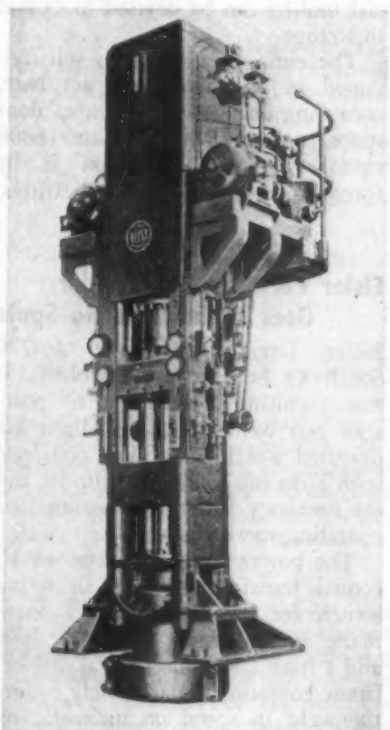
Eisler portable gun welder

operated air valves, air filter, pressure regulator, gage and switch and an air line oiler.

The unit is self-contained. The welding gun is free swinging, attached to a beam, counter-balanced against the transformer, and can be mounted horizontally or vertically or fixed on a low base. These units are manufactured in sizes from 30 to 150 kva. Throat depth is adjustable from 12 to 48 in.

Bliss Duplex Press Has Individual Slide Control

A duplex hydro-dynamic press, built by E. W. Bliss Co., Dept. P.M., 53 St. and 2 Ave., Brooklyn 32, N. Y., is designed for pressing deep sections and also flanged objects in powdered metals wherein one portion of the work must be pressed at a different speed than another.

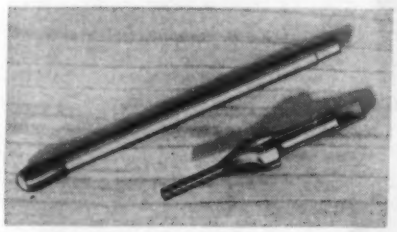


Bliss Duplex Hydro-Dynamic press

This type press features independent pressure, stroke and speed control of each slide. Separate pumping units are furnished for each slide.

An automatic cycle is provided with the following sequence: quick closing to the work; simultaneous pressing by the two slides at predetermined adjustable speeds and pressures; automatic reversal of upper slide; use of lower slide as ejector; timed pause for loading and automatic return of lower slide.

Presses are available in capacities ranging from 50 to 5,000 tons. Automatic loading devices and core rods for bushing work are optional features.



Gay-Lee cutting tool beside a match

Gay-Lee Announces Line of Form Ground Cutting Tools

Gay-Lee Co., 117 East Hazelhurst, Ferndale 20, Mich., announces a complete line of cutting tools, form ground with cam relief. Features in the line are standard gear tooth pointers and special tools ranging upward in size from 1½ in. dia.

Tubular Adjustable Limit Gages Accurate, Economical

Tubular Micrometer Co., St. James, Minn., announces a new tubular adjustable limit snap gage described as providing greater accuracy and to be more economical to use.

The increased accuracy is attributed to: 1. less expansion, due to lower thermal conductivity resulting from heat reflection by the chrome finish and to more rapid heat dissipation due to the tubular construction; 2. less spring, inasmuch as the tubular construction distributes the strain equally instead of localizing it; 3. more sensitive feel, made possible through reduction of gage weight to ½ to 1/10 that of conventional type; 4. construction of steel of homogeneous grain structure prevents warpage or growth; and 5. ease of resetting in square holes.

Borcoloy Tool Bits Feature Wear Resistance and Hardness

General Aircraft Equipment, Inc., Tool Division, South Norwalk, Conn., has announced Borcoloy, a new ferrous cutting alloy with outstanding wear resistance (derived from its boron constituent) and red hardness (from cobalt) characteristics.

Two grades are available: Grade 5 with 12 percent cobalt is recommended for hogging and heavy duty cutting on high alloy steels, heat-treated bar stock or forgings. Its red hardness enables it to hold a keen cutting edge at very high temperatures. This grade is used only for solid tool bits. Grade 6 with 20 percent cobalt is especially recommended for rough turning work, as well as fine finishing at speeds too high or on material too abrasive for high speed steel tool bits. Its red hardness is greater than that of grade 5.

Kindt-Collins all-purpose disc grinder

Kindt-Collins Disc Grinder Designed for Ease of Operation

An all-purpose disc grinder for any type of metal, wood or plastic material has been developed by the Kindt-Collins Co., 12651 Elmwood Ave., Cleveland 11, Ohio.

Principal features of design and construction are: 1. the 30 in. disc with 26 in. high grinding area; 2. hydraulic controls which eliminate all gears, worms and jack screws ordinarily employed for raising, lowering and tilting the table; 3. an accurate position stop provided on protractor for stopping table in any position from 45 deg. down to 15 deg. up; 4. ventilated table with properly placed perforations to channel dust into highly efficient

dust guards; and, 5. paper or cloth discs may be removed and replaced without removing the steel disc.

A conveniently located handle operates the hydraulic valve and 10 in. handwheel controls every hydraulic operation. Start and stop button control is mounted at eye level on the front of the machine. The table, 37½ in. from the floor, can be lowered to 4 in. from the bottom of the disc.

Disc speed is 800 r.p.m., giving a rim speed of 6,260 r.p.m. The regular model, which employs an inch-thick, heavy-duty grinding disc, is equipped with a 3 hp., ball bearing, 1,150 r.p.m., a.c., 2 or 3 phase motor, while the heavy-duty unit uses a 5 hp. motor of the same type.

Bullard Twin 6 and Twin 8 Spindle Mult-Au-Matic Chucking Machines Double Productive Output

The Bullard Company, Bridgeport 2, Conn., announces Type DF Twin 6 and Twin 8 Spindle, a new class of Mult-Au-Matic chucking machines, designed for smaller work. Two of the 12 or 16 spindles are used for chucking while the balance are machining.

Twin tooling on the head at each station performs identical operations on the work in each of the twin chucks, thereby doubling the output from one machine at only a slightly greater investment. Tooling is the same as on a standard 8-Spindle Mult-Au-Matic.

Specifications common to each type include: capacity, 8 in. dia., 10½ in. height; 3-jaw Universal chucks 10 in. dia. to grip 8 in. in dia. Hydraulic power operated chucking is standard. Adjustable pressure from 100 lb. to 8,000 lb. per jaw; spindle speeds may be set individually for any desired speed at each station in 41 changes from 64.0 to 583 r.p.m.; 82 listed changes of feeds per revolution of spindle are possible between 0.003 and 0.126 with many other changes possible by merely changing the back gears.

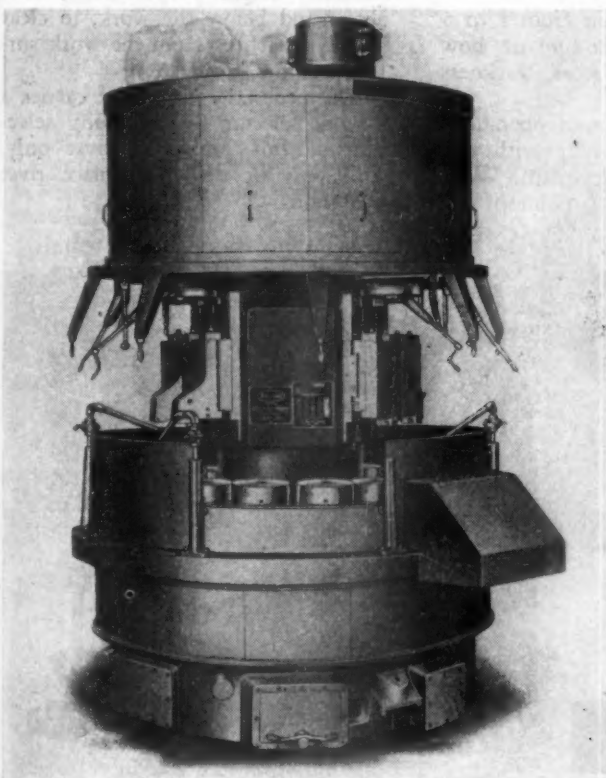
The Twin 6 has 5 tool and 1 loading stations, while the twin 8 differs in having 7 tool stations. Each is powered by a motor drive direct connected through a coupling, 50 hp. for the former, 60 hp. for the latter; each develops 1,760 r.p.m. under load and maintains constant speed a.c. or d.c.

American Rotary Carburizer Designed for Small Work

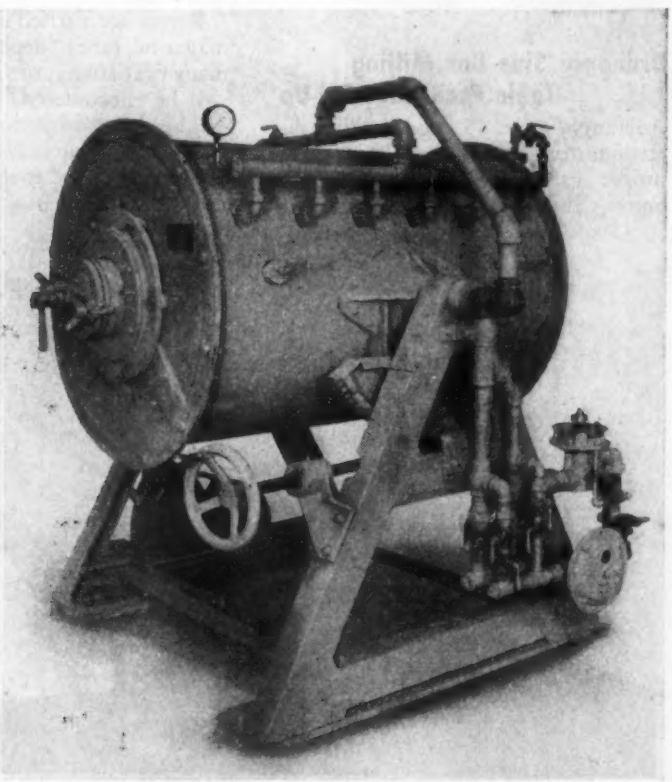
American Gas Furnace Co., Elizabeth, N. J., announces its improved No. 2GA rotary gas carburizer, designed especially for balls and small work. With such use in mind, the neck of the furnace is made smaller and turns in roller bearings that need no lubrication. The small spacing is less expensive to replace, and covers are lighter and easier handled. The wall thickness of the retort is uniform and this, plus greater concealment of retort within furnace, makes for more uniform temperature.

The machine is described as excellently adapted for hardening, annealing, or normalizing under controlled atmosphere, in addition to carburizing. Any desired atmosphere may be introduced through a connection provided for that purpose, preventing ingress of any unwanted gas.

Twelve-sided and reduced at both ends, the retort is especially suited for handling small articles. Rotation makes for more uniform drawing on parts that are likely to nest and which will not be damaged by tumbling. The smaller entrance permits a more gradual discharge for quenching. The carburizing gas may be pre-heated before entering the work chamber. A carburizing atmosphere keeps the work bright.



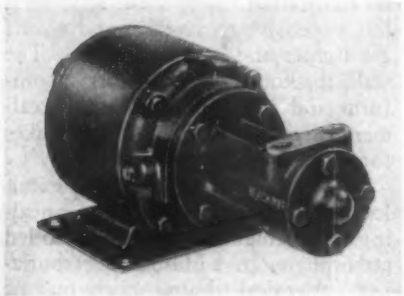
Bullard Twin 8 Spindle Mult-Au-Matic



American No. 2GA rotary gas carburizer

Blackmer Small Capacity Rotary Pump is Self Adjusting

A direct connected small capacity rotary pump designed and built by the Blackmer Pump Co., Grand Rapids, Mich., is self-adjusting for wear and maintains normal capacity throughout the life of the easily replaced buckets.



Blackmer rotary pump

The specifications are as follows: capacity, ½ g.p.m.; discharge pressure 100 psi.; direct connected by a flexible coupling to an 1,800 r.p.m. motor.

Built in relief valves are optional and the units are available for belt drive, as a pump only, or the rotating elements may be supplied where the pump is installed as an integral part of a machine.

Ordnance Sine Bar Milling Table Facilitates Set-Up

Any angle up to 45 deg. in either direction may be obtained by placing proper gage blocks under the sine buttons and locking in position a new Sine Bar Milling Table introduced by the Ordnance Gauge Co., 4080 Frankford Ave., Philadelphia 24, Pa. A multiplicity of angles may be cut without disturbing the alignment of the work.

Vises, angles or the work proper may be conveniently clamped to this table and placed on almost any conventional machine, thus broadening the nature of work they can handle.

Lukens Steel Plate Weight Calculator and Size Selector

A combination steel plate weight calculator and size selector has been developed by Lukens Steel Co., Coatesville, Pa. With the calculator, which operates somewhat like a slide rule, it is possible to determine quickly the theoretical weight of any steel place from 10 to 200 in. width and 3/16 to 6 in. thickness. With the selector can be determined the longest and widest steel plate obtainable for any desired thickness. Included with the selector is an imprinted table giving decimal equivalents and weights of plates.

Republic Develops Hard Cased Thread and Plug Gages

The V-nide, a new, long-wearing, extremely hard gage has been developed by Republic Gage Co., 2228 Fenkell Ave., Detroit 21, Mich. The long-wearing quality derives from a case of Rockwell C73-75 hardness.

Other qualities cited for V-nides include: same coefficient of expansion as steel; available in "W" tolerances; extremly hard with tough core; same "feel" as tool steel gages; and take a high finish.

General Drivmatic, Described as Four Machines in One, Automatically Carries Through Riveting Cycle

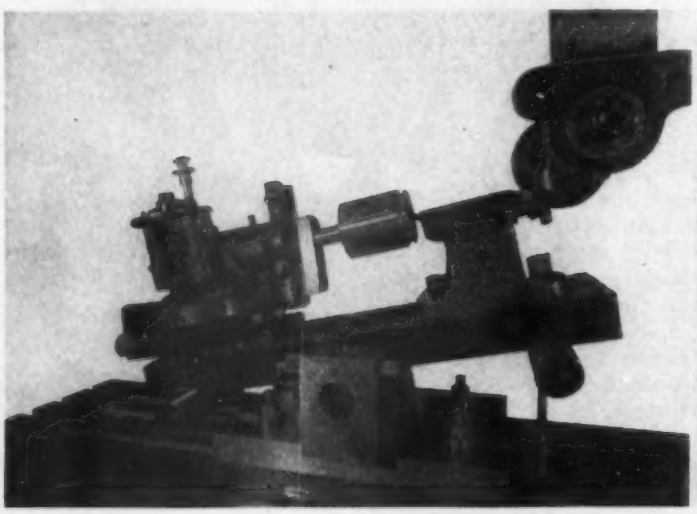
The Drivmatic announced by the General Engineering Co., Hertel & Elmwood Aves., Buffalo, N. Y., is described as four machines in one: It drills, countersinks, selects proper length rivet for stock thickness and feeds and heads rivets—all in one operation.

Rivets are carried in from 1 to 5 magazine tubes, depending on how many variations of stock thickness will be encountered.

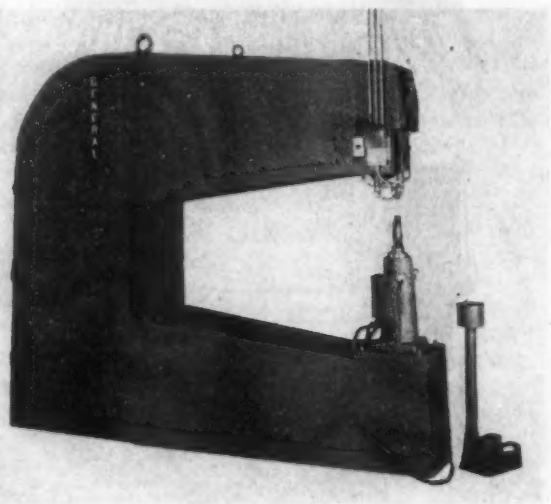
The entire sequence of operations takes place automatically with one depression of the foot switch. Work can be stopped at any point of the drilling operation and the cycle started over by releasing the foot switch. All operations are electrically interlocked so that the machine stops automatically if any part fails to reach its proper location on time.

Air streams are delivered automatically at the proper times, both above and below the work, to clear the drilled chips from the work surface and the lower anvil.

The pedestal control box carries a 4-point selector switch giving selection of full automatic, rivet only, drill only or drill and place rivet operations.



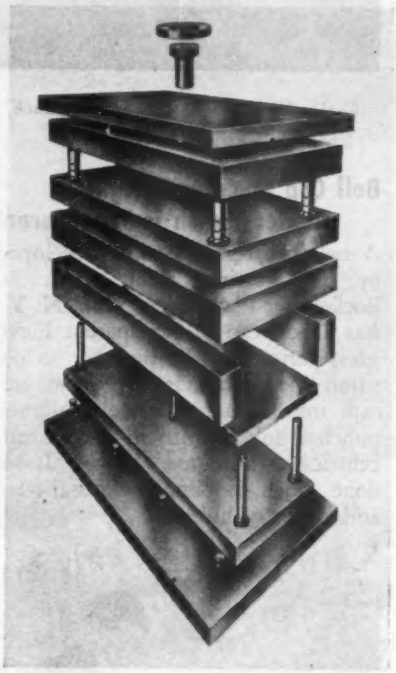
Ordnance sine bar milling table



General Drivmatic

Detroit Mold Pre-Fabricated Plastic Mold Bases Save Time

A new and larger sized set of pre-fabricated parts for plastic mold bases is announced by the Detroit Mold Engineering Co., 4837 Woodward Ave., Detroit 1, Mich. This new set of parts, known as the 55-S sries, is 23½ in. long and 12 in. wide.



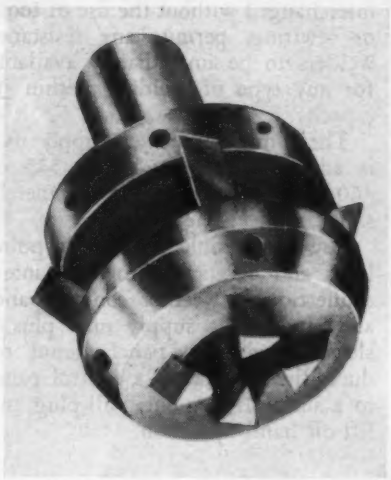
Detroit plastic mold base parts

All surfaces of the cavity retainer plates are ground and the leader pins and bushings are installed. The other parts are machined to close tolerances. Sprue bushings, return pins, dowels and screws of proper length and size are furnished with the set ready for the die maker to place them.

Weddell Tri-Bit Blades Now Applied to Hollow Mills

Tri-Bit cutter blades, manufactured by Weddell Tools, Inc., Rochester 7, N. Y., are now applied to hollow mills.

The triangular tool bits fit into triangular shaped holes in a hollow mill cutter body, each locked and unlocked by a single lock screw. The blades are backed up and adjusted by single adjusting screws or all may be simultaneously adjusted by a single adjusting nut. There are no slots in the cutter body as the cutter blades fit into holes which permit the cutter body to be tied together all around the diameter, giving maximum strength in a minimum diameter. The triangular shape of the Tri-Bit gives chip clearance.

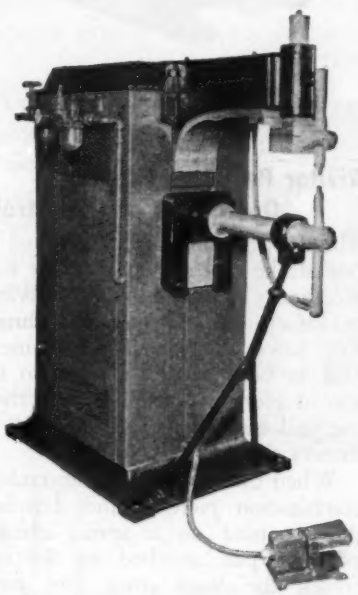


Tri-Bit hollow mill

Tri-Bit hollow mills are furnished with standard blades of high speed steel, cast alloys or carbide tipped.

Rex Spot Welders to 250 KVA Available from Interstate

Rex spot welders, distributed by Interstate Machinery Co., 1431 W. Pershing Rd., Chicago 9, Ill., are now obtainable in standard or automatic repeat, air operated, rocker arm or press type in 10, 20, 30, 40, 50, 75, 100, 125, 150, 200 and 250 KVA capacities. Foot operated can be had in 2½ to 75 KVA and motor driven types in 10 to 100 kva.



Rex spot welder

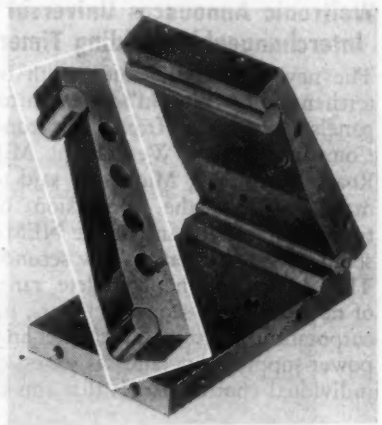
Taft Peirce Makes a Line Of Steel Straight Edges

The Taft-Peirce Manufacturing Co., Woonsocket, R. I., is now manufacturing a line of steel straight edges. They are of suitable proportions and are hardened, drawn and accurately ground. These six sizes range from 12 to 72 in.

Dow Stripcoat Preserves, Protects and Packs Metal

Stripcoat, a hot metal dip type of package, developed by The Dow Chemical Co., Midland, Mich., is said to preserve, protect and package metal parts in one operation. It is easily adaptable to production line procedure and manufacturers now using it report that it saves from 60 to 90 percent in packaging time as compared to conventional prewar methods.

The coating sets quickly without the aid of mechanical drying equipment, and it is easily removed, merely by slitting and stipping from the part.



Brand sine plate and (inset) sine bar

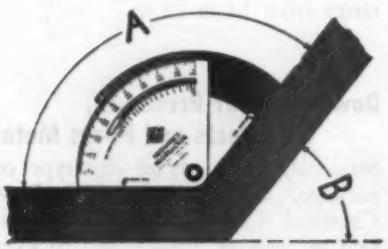
Brand Sine Plates and Bars Measure Angles, Locate Work

Sine plates and sine bars manufactured by Brand Tool & Supply Co., 500 West Washington Blvd., Los Angeles 15, Calif., are used for measuring angles accurately, or for locating work within a given angle within very close limits.

The 5 in. sine plates are 4 in. wide and the sine bars 1 in. wide. The measuring studs are of identical diameters, located 5.0000 in. ± 0.0002 in. from center to center. Ten inch sine bars and plates can also be furnished.

Interstate Protractor is Light, Sturdy and Pocketable

A new, improved mechanic's protractor is now being offered by the Interstate Sales Co., 1123 Broadway, New York 10, N. Y. Made of Vinylite



Interstate mechanic's protractor

plastic, it is described as light, sturdy and impervious to warping or burning. It measures 3¼ × 3¼ in. over-all.

Setting the two blades of the protractor simultaneously gives reading for outside angle "B" (see illustration), reading for inside angle "A" and reading in i.p.f. against degrees.

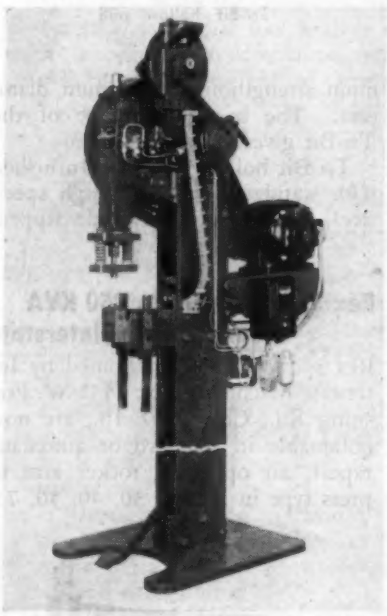
Weltronic Announces Universal Interchangeable Welding Timers

The new Universal Timers with interchangeable "plug-in" type control panels, available from Weltronic Company, 19500 West Eight Mile Road, Detroit 19, Mich., are said to make possible the conversion of timing controls to any of the NEMA standard types in only a few seconds. The design of the complete range of new weld and sequence timers, incorporating a universal cabinet-and-power-supply unit and a series of individual control panels that can be interchanged without the use of tools or rewiring, permits any resistance welders to be immediately available for any type of welding within its capacity.

The Universal power supply unit is adaptable for 115, 230, 575 or 460 v, 50/60 a.c. service by merely shifting one jumper.

Use of a flexible cable, multi-point plug and receptacle for the interconnection between a control panel and the power supply unit plus a slotted-hinge type panel mount reduces the removal of a control panel to a simple swing-out, pull-plug and lift-off hand operation.

Weltronic Universal timer

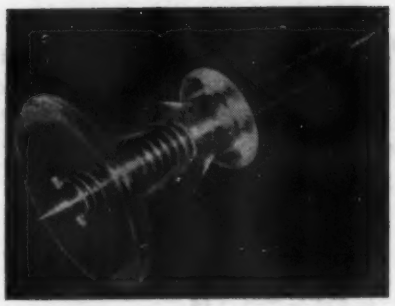


Tomkins-Johnson Rivitor

Rivitor Performs Three Operations at One Stroke

Three operations are performed at one stroke of the ram with the new electrically powered T-J Rivitor, manufactured by Tomkins-Johnson Co., Jackson, Mich. The machine is said to be specially adapted to the job of piercing, dimpling and riveting bail ears on pails, using 1¾ lb. tinners rivets.

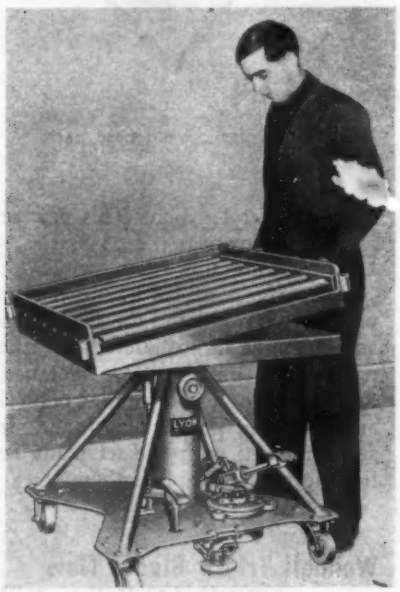
When the Rivitor ram descends, a combination piercing and dimpling die mounted on a spring-actuated pressure pad attached to the ram forces the work over the rivet, piercing and forming a dimple in the pail and ear. The dimple is deep enough to prevent the manufactured head of the rivet from projecting inside the pail. At the end of the down stroke, the rivet set forms a slightly rounded head on the rivet.



Curtiss-Wright bell cap center punch

Bell Cap of Curtis-Wright Center Punch is Transparent

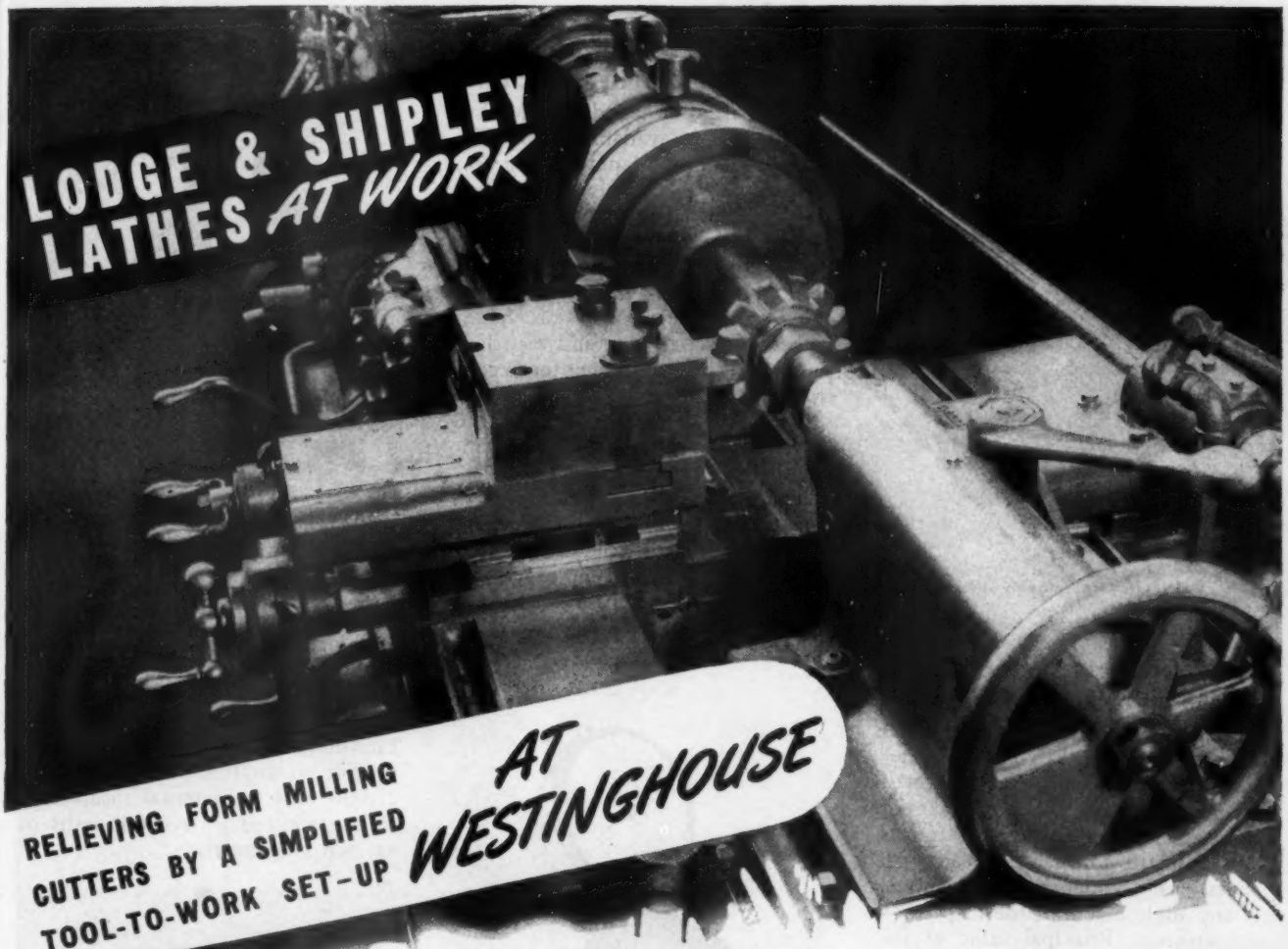
A bell cap center punch, developed by the Curtiss-Wright Corp., 30 Rockefeller Plaza, New York, N. Y., has a bell cap of transparent Plexiglas, permitting the operator to position the point visually. The bell cap insures an accurately aligned punched hole in work on flat and concentrically contoured surfaces. It has done much to eliminate misaligned and mismated holes.



Lyon-Raymond roller top

Roller Top for Lyon-Raymond Hydraulic Elevating Tables

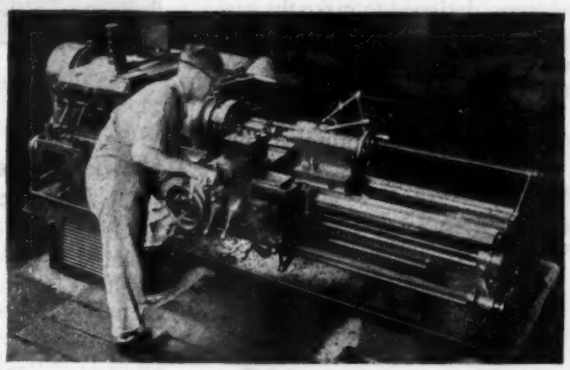
A removal and reversible roller top is announced by The Lyon-Raymond Corp., 1748 Madison St., Greene, N. Y., as an optional feature for its hydraulic elevating tables. Installation or removal of the roller top is instantaneous, since the framework fits down over the permanent top, eliminating any necessity for bolts or other fastening. The conveyor rolls are ball-bearing supported.



• The Merchant Marine Division of Westinghouse Electric and Manufacturing Company installed this 14" toolroom lathe on the merits of its simplified method of setting the tool to work —a feature obtainable only on Lodge and Shipley Lathes.

An important advantage of this lathe—in addition to its usual tool room applications —is the universal relieving attachment with exclusive operating conveniences to reduce setup time. Highly adaptable and simple to operate, this precision unit can be used for right or left hand leads; end, internal or external, plain, angular, or spiral, relieving work.

At Westinghouse, Lodge and Shipley's engine and toolroom lathes—14" or 25"—meet highest standards of lathe performance. On your work, too, whether standard or special, Lodge and Shipley Engineers can help turn it better at lower cost. For further details on L & S tool room lathes and universal relieving attachment, write on your company letterhead for Bulletin 508-BO.



THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

ENGINE — TOOL ROOM — AUTOMATIC — OIL COUNTRY LATHES

Taft-Peirce snap gage stand

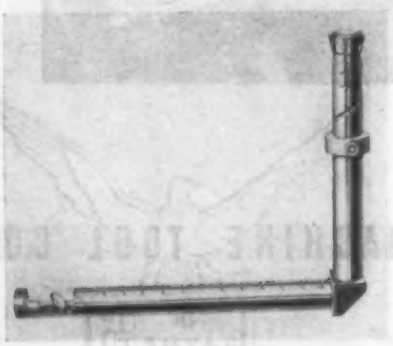
Taft-Peirce Tool Holder Will Take all Makes of Snap Gages

A new universal tool holder, manufactured by The Taft-Peirce Manufacturing Co., Woonsocket, R. I., will accommodate any type or make of snap gage, including all AGD frames and standard adjustable thread snap styles. The holder may be clamped at any angle that suits the inspector's convenience. Principal value of the new holder is that it permits standardization on a single piece of equipment, eliminating the need for a special holder for each type gage.

Polan Borescopes for Internal Cylinder Viewing Available

Borescopes, designed to make the surface of long bores accessible to the human eye in order to inspect for minute cracks or other surface faults, are available from Polan Industries, 1356 Fifth Ave., Huntington, W. Va.

Borescopes will cover a diameter range from 13/16 to 9 in. and a bore length up to 30 ft.



Polan Borescope

Nopak Valve Designed for Low-Pressure Hydraulic Lines

The Nopak ¾ in. hand operated hydraulic valve, available from The Galland-Henning Manufacturing Co., 2756 South 31 St., Milwaukee, Wis., was developed for dependable leak-proof service on lines at pressures up to 300 psi. It embodies all the NOPAK features, such as the patented cored disc, precision hand-lapped surface of disc and seat, line pressure-sealing and finger-touch control. In addition it incorporates a stuffing box with gland nut in the valve-stem assembly, to prevent seepage there.

The valve is made in all-bronze construction, with lubricating channels in disc and seat, for water-hydraulic service and in semi-steel, without lubricating channels, for oil-hydraulic service.

Sheffield Thredcheck

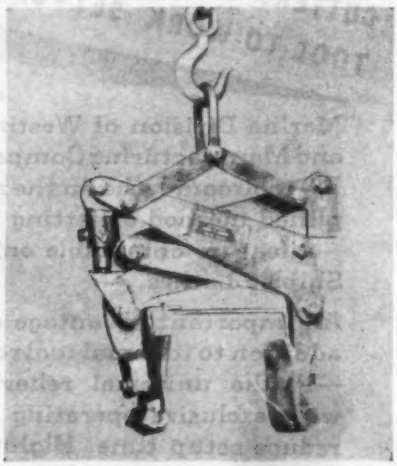
Sheffield Thredcheck and High Amplification Precisionaire

Two new gaging instruments are announced by Sheffield Corporation, Dayton 1, Ohio.

The Thredcheck is said to make possible a more complete check of threaded parts through use of the principles of the indicator snap and thread roll-snap gages. It has a standard balanced type large indicator graduated in 0.0001 in. mounted on it and employs a movable NO GO top roll, variations of which register low or high pitch diameter on the indicator. The instrument can be placed in the standard thread roll-snap stand and used on the bench, or used dismounted for checking work at or in the machine. Wear is compensated for by adjusting the rolls on their eccentric pins.

Sheffield high amplification Precisionaire

An unusually high amplification Precisionaire has been developed to provide an amplification of 20,000 to 25,000 to 1 on internal measuring. It is graduated in five-millionths of an inch increments.

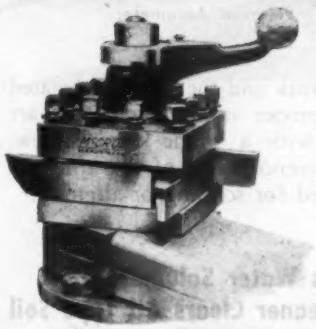


Heppenstall tongs

Heppenstall Mass Producing Series of Automatic Tongs

Special automatic tongs with lifting capacity to 60,000 lb., formerly manufactured only on special order, are now being mass produced by Heppenstall Company, 4622 Hatfield St., Pittsburgh, Pa. With these tongs it is possible to lift and tip certain heavy loads through a 90 deg. vertical angle. They can be used in series to handle loads and are being tied in with conveyor belts in various ways. They have been used to handle the 250-lb., 8-in. shells.

McCROSKY *Turret* TOOL POSTS



Give Engine Lathes the Versatility of Turret Lathes

NO stopping the lathe for tool changes on this job. The McCrosky Hexagon Turret carries all the tools needed to face, drill, bore and ream, permitting the operator to index the next tool into cutting position, quickly and accurately.

Mounted on the T-slot of the compound rest, or bolted on the main slide, McCrosky Turret Tool Posts permit engine lathes to be used on many complicated jobs previously assigned to more specialized machines. They have proved their efficiency and economy on every type of lathe, and all kinds of work.

McCrosky Turrets save time otherwise required for tool changes. They assure increased production and reduced operating costs. Furnished in 5 styles, including square and hexagon designs, and 6 different sizes. Write for complete details today.

Send for the No. 16-E Turret Tool Post Catalog

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS

Block Type BORING BARS

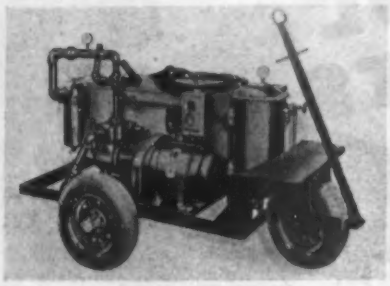
Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS

Turret TOOL POSTS

Pacific De-Sludger Cleans Oil Coolers and Engines in Planes

Unit No. 2025, for de-sludging and cleaning aircraft oil coolers and engines without the necessity of removal from the plane, is announced



Pacific aircraft de-sludger

by Pacific Airmotive Div., Airplane Manufacturing & Supply Corp., 409 N. Brand Blvd., Glendale 3, Calif.

The unit consists of a 25 gal. insulated tank with sight level gage. The tank is electrically pre-heated with two immersion type heaters with thermostat temperature control. A rotary vane type pump with built-in bypass, powered by either electric motor or aircooled gasoline engine provides adequate pressure. Two oil filters are furnished: one, an absorption type, the other, a metal disc type with revolving cleaner handle.

A four-way valve reverses the flow of an approved commercial solvent at frequent intervals. This causes a surging action which breaks down any built up sludge. Two 10 ft. ×

South Bend Announces New Nine Inch Toolroom Lathe

A new 9 in. toolroom lathe for exacting toolroom or production operation, announced by the South Bend Lathe Works, 378 E. Madison St., South Bend 22, Ind., has a 9¼ in. swing and takes 22 in. between centers. It has a maximum collet capacity of ½ in. and ¾ in. spindle bore.

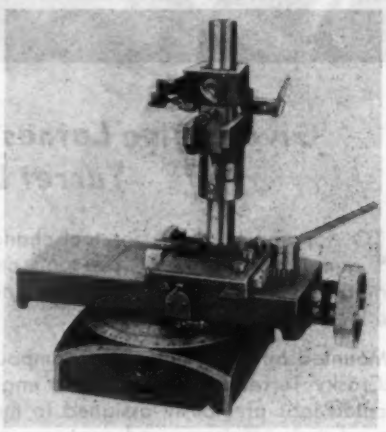
South Bend 9 in. toolroom lathe

The 12 spindle speeds range from 41 to 1,270 r.p.m., with back-gear drive for the lower speeds. A quick change gear box permits cutting 48 pitches for screw threads, 4 to 224 per in., and provides 48 power longitudinal feeds and power cross-feeds. The lathe is equipped with a handwheel draw-in collet attachment, collet rack, taper attachment, thread dial indicator, thread cutting stop, large and small face plates and micrometer carriage stop.

Radiform Speeds Tool Forming, Eliminates Wheel Preforming

Radiform, a new radius and angle forming instrument, has been developed by the W. F. Meyers Co., Bedford, Ind. This device will generate radii and angles tangent to radii on end mills, die sinking tools, drills and reamers, both straight and spiral fluted, directly against a grinding wheel, without preforming.

Clearance angles are pre-determined as are the radii and angles to



Radiform wheel and tool former

be formed. Accuracy is assured by micrometric adjustment before forming.

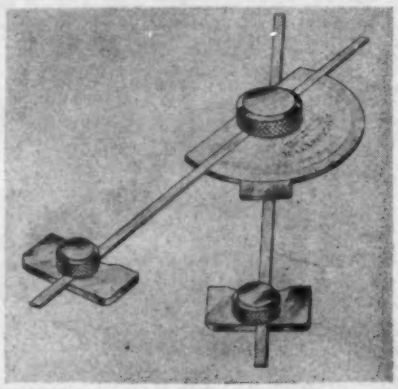
The 24-notch indexing head, built in the collet holder, permits the forming of both primary and secondary clearances without changing the setup of the instrument. Either spherical radii, or smaller end radii, are obtained by simple micrometer adjustment of the compound slide. It is also used to produce formed wheels.

No special skill is required to operate the fixture, which can be mounted on different types of grinder tables.

Peterson Arcometer Measures Arcs Along a Circular Edge

The Arcometer, an instrument for measuring arcs along the internal or external circular edge of a surface, is now available from Peterson Precision Instrument Co., 10144 S. State St., Chicago 28, Ill. It is supplied with hardened heads for internal or external applications and with 9 in. bars suitable for internal diameters of 5¾ to 16 in., inclusive; other sizes are available on special order. The protractor is equipped with a vernier, enabling the user to read within minutes of a degree.

In operation, the corners of the heads are brought against the edge



Peterson Arcometer

of the work and the arms are rotated to the proper angle, where they are locked with a single thumb-screw. The reference edges of the arms are then used for scribing or aligning.

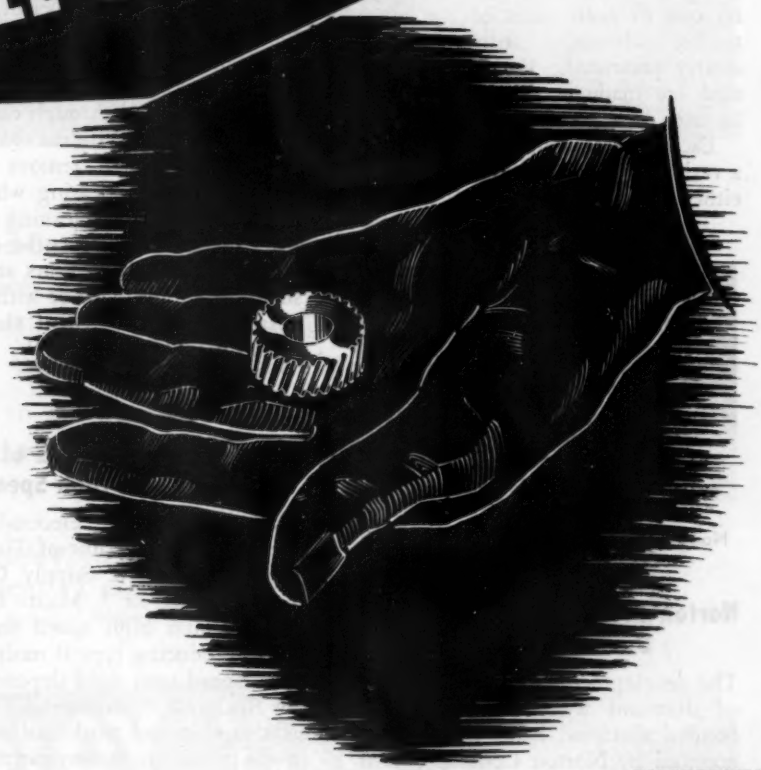
Phillips Water Soluble Metal Cleaner Clears All Type Soil

SWIRT, an emulsifying cleaner said to be entirely harmless to the worker and the work, but acting efficiently upon all types of soil, grease, buffing compounds, cutting and machining coolants and oils, is announced by Phillips Chemical Co., West Touhy Ave., Chicago 45, Ill. It is said to act equally well upon ferrous and non-ferrous metals.

The cleaner is practically odorless and gives off no disagreeable or injurious vapors. It will not etch or pit and can safely be used on the most sensitive metals and alloys. Its flash point is 155 deg. open cup. It can be used in practically any sort of container and stays clean longer because it merely loosens soil and grease to be carried away in the following water rinse.

NOW YOU CAN FINISH GEARS

AS BIG OR BIGGER
AS SMALL OR SMALLER



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MICHIGAN TOOL COMPANY

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FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

New Method Letter-Outline stamp

Two Series of New Method Stamps Speed Identification

Two new hand stamps have been announced by New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich.

"Letter-Outline" hand stamps are designed to convey additional information by utilizing a large letter as an outline with other facts indicated by insertions within.

By incorporating minor but instantaneously identifiable variations in the designs of a series of inspector's stamps—in the form of short bars on one or both sides of the other marks, additional information is clearly presented. Variations in design are made up by New Method to meet each user's needs.

Each type of stamp is available in a variety of sizes and shanks are made either plain or knurled.

Norton vitrified bonded diamond wheel

Norton Producing Vitrified Diamond Bonded Wheels

The development of a vitrified bonded diamond wheel and a vitrified bonded diamond hand hone, is announced by Norton Company, Worcester, Mass. The outstanding feature of each is the combination of a fast cutting action with extremely long life. Marked ability to hold a sharp corner and postpone the development of radii is an advantage for chip breaker grinding. Another advantage set forth is ability to grind shank steel with little tendency to glaze or load.

L & R bearing cleaning machine

Bearing Cleaning Speeded by Machine Available from L & R

L & R Manufacturing Co., 577 Elm St., Arlington, N. J., announces its Model 100 cleaning machine for precision ball bearings up to 2 in. O.D. In the basket of the rotary cleaner, from 50 to 100 bearings of various sizes may be pre-cleaned. In the pressure cleaning tank, continuously filtered solution under six to 10 lb. pressure is forced through each bearing individually. Filtered compressed air is provided to remove surplus solvent from the bearing while it is still on the pressure cleaning spindle.

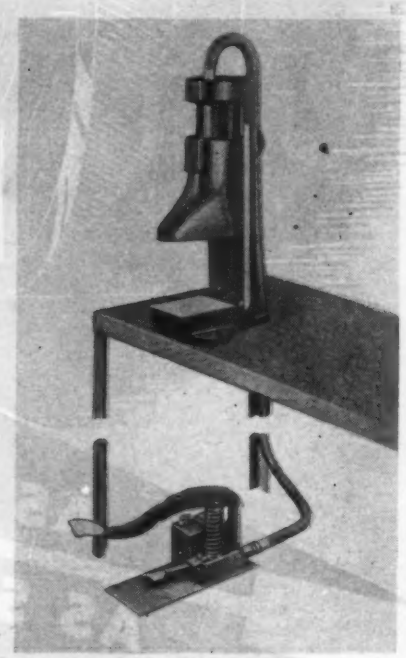
With minor changes, the machine can be used to clean gears and other small assemblies with or without ball bearings. The basket of the rotary cleaning unit measures 5½ in. I.D. × 3⅜ in. deep.

Two Eureka Electrodes of Hot Work and High Speed Steel

Two new Eureka electrodes have been added to the line of The Welding Equipment & Supply Co., 223 Leib St., Detroit 7, Mich. One is a molybdenum high speed steel electrode producing typical molybdenum high speed steel weld deposits at 60-64 Rockwell C hardness. The other is a superior hot work tool steel electrode producing carbon-molybdenum-chromium deposits having extreme hardness and abrasion resistance at high heat with Rockwell C hardness of 58-62. Both produce "hard-as-welded" deposits which can be heat treated.

Reimuller Hy-Speed Precision Punch Press Has Many Uses

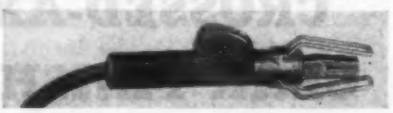
Combining the features of the V-way vise and the gap style press is a new precision bench press of semi-steel construction, manufactured by Reimuller Brothers Co., 9400 Belmont Ave., Franklin Park, Ill. Designed for a more speedy and efficient handling of many production jobs, the "V" ways eliminate the use of die



Reimuller Hy-Speed press

shoes. It is made in 5 ton size and has 5×6 in. platen with 7 in. of ram movement.

The machine is adaptable, with proper equipment, to use as a tensile and compression testing unit up to 5 ton and as a pipe vise to handle up to 6 in. pipe, or as a shear for ¼ in. plate and ½ in. rounds.



Lincoln light weight electrode holder

Light Weight and Low Cost Mark Lincoln Electrode Holder

A new holder for welding electrodes, said to be lighter (32 oz.) and lower in cost than other insulated holders of equivalent capacity, has been announced by The Lincoln Electric Co., Cleveland, Ohio. Having a current rating of 300 amp. with ample ca-

3 STANDARD WHEEL DRESSERS FOR ALL GRINDING WHEEL REQUIREMENTS . .

When you use diamond-impregnated Carboloy Dressers, just three standard sizes—easy to order—cover practically all of your grinding wheel requirements. Carboloy Dressers eliminate all remountings and accidental diamond loss, require no special adaptors, withstand greater abuse, and save at least 25% in annual dresser costs. Uniformly priced at $9.60, $12.60 and $15.35 in eight standard holders. Send for descriptive leaflet.

CARBOLOY COMPANY, INC.
11149 E. 8 MILE STREET, DETROIT 32, MICHIGAN
Chicago • Cleveland • Houston • Los Angeles • Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston

SEND FOR DESCRIPTIVE FOLDER

Another USE FOR CARBIDES

CARBOLOY CEMENTED CARBIDE DIAMOND IMPREGNATED DRESSERS

For GENERAL USE ON GRINDING WHEELS

pacity for overload, the new holder will handle various sizes of electrodes ranging from 1/16 to 1/4 in. dia.

The holder jaws, of high conducting and wear resisting copper alloy are described as able to withstand rough treatment. They are fully guarded from contacting the work by durable, easily replaceable spring steel insulating guard. The trigger of the holder is of molded, heat-resisting inorganic material.

Denison Oil-Hydraulic Bench Press Adapted to Many Uses

Multipress, an oil hydraulic press of many uses, introduced by The Denison Engineering Co., Columbus, Ohio, will deliver from 300 to 8,000 lb. downstroke pressure and as much as 5,000 lb. pull up pressure. It is completely self-contained in a streamlined 16 × 26 × 34 in. housing and weighs 745 lbs. It has been designed to utilize a wide variety of accessories and fixtures with which it can perform innumerable production operations, such as pelleting, honing, broaching, peening, assembling, burnishing and straightening.

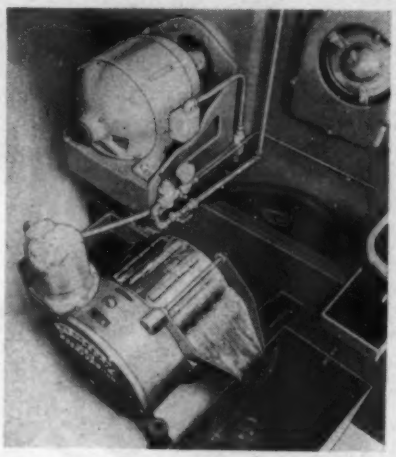
Ram speed can be regulated between 20 and 200 i.p.m. Ram travel can be preset for strokes of from 6 to 1/16 in. All working parts within the frame are of unit construction, readily accessible and removable. The working space provided is: daylight opening 11 in.; table 16 × 10½ in.; throat opening 6 in. A 3 hp. electric motor furnishes power. A pressure gage is located in the throat.

Drilled and tapped mounting pads, for attaching extension tables, are provided on the basic unit. Extension tables increase the working surface of the units to 10½ × 32 in.

Denison Multipress

Barnes Magnetic-Automatic Coolant Separator Available

The outstanding feature of a magnetic-automatic coolant separator, produced by Barnes Drill Co., Rockford, Ill., is its automatic operation, said to reduce maintenance to a minimum and allow the operator to devote full time to productive work. There are no filters employed to require changing and all swarf and



Barnes coolant separator

magnetic particles are automatically removed through magnetic attraction.

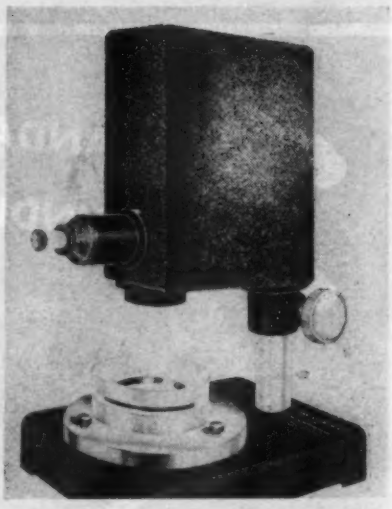
The separator is a self contained, motor driven unit, employing a magnetic rotary drum, which attracts metallic particles as they pass through the coolant and carries them out as the drum rotates. The particles form on the drum and are scraped off and discharged through a chute into a movable pan. The coolant returns to the reservoir, ready for immediate recycling.

Two sizes of separator, each employing a ¼ hp. motor, and having capacities of 10 and 20 g.p.m., respectively, are available.

Acme Light-Wave Device For Measuring Parallelism

A new instrument especially designed for measuring the parallelism of seal rings and similar objects, and to determine the change of parallelism under any desired pressure, has been announced by the Scientific Division, Acme Industrial Co., 200 N. Laflin St., Chicago 7, Ill. The machine may also be used for measuring the comparative heights of objects, such as balls for precision bearings, all of which must be the same size within a few millionths.

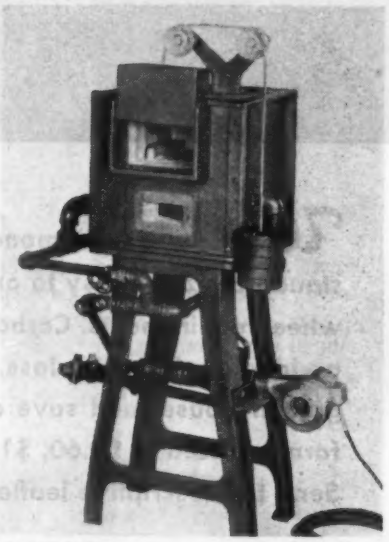
The manufacturer further claims



Acme parallelism measurer

that this new instrument can also be used for making the usual light-wave check for flatness.

The instrument will measure work up to 6 in. dia. and ½ in. thick. Other sizes and greater thicknesses can be accommodated by special arrangement. It comes complete with built-in light source and transformer for operation on 110 v., 60 cycle a.c.



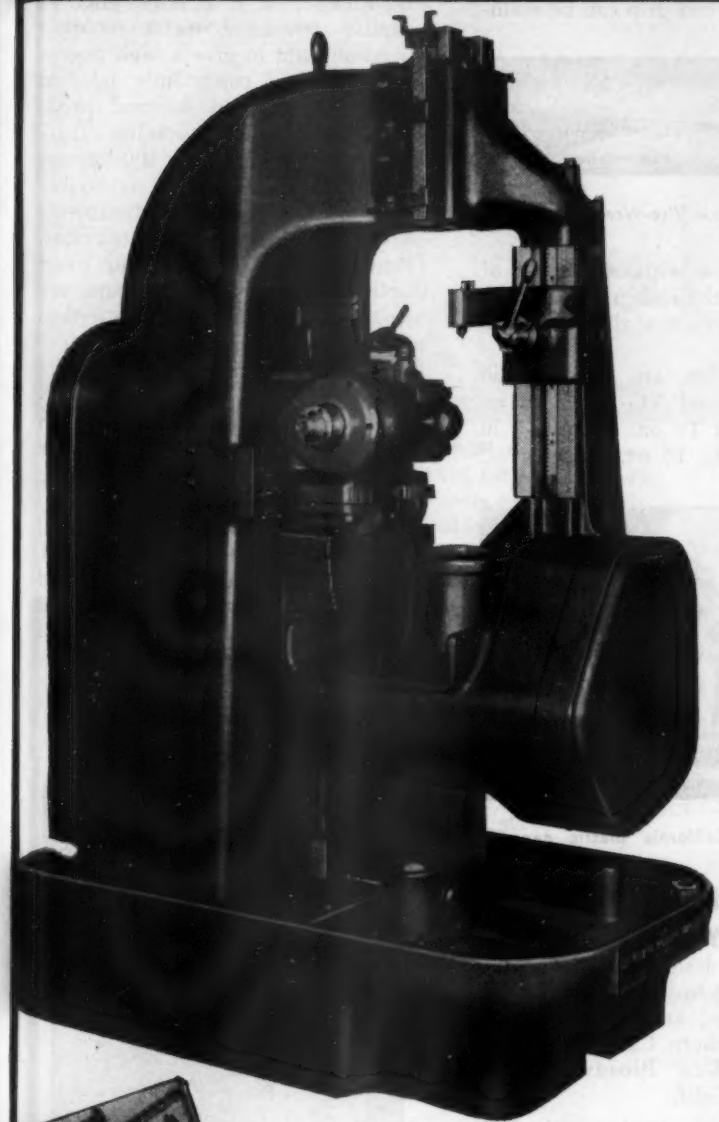
Barkling multi-purpose tool room furnace

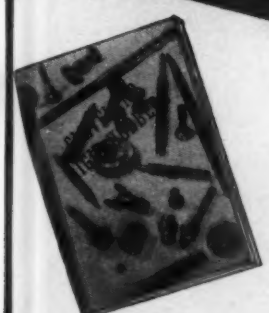
Barkling Tool Room Furnace Has Three Heating Areas

A new, pedestal type, multi-purpose heat-treating furnace, now being produced by the Barkling Fuel Engineering Co., 400 N. Paulina St., Chicago 22, Ill., provides three heating areas in the one installation. It has an indirect heating chamber, with door opening 4½ × 8 in., for hardening,

Can I do climb hobbing on a

RIGIDHOBBER?





This bulletin tells all about Rigidhobbers—what they are — how made—and how they can help you reduce costs.

Yes!...

but that's not all — the hob can be made to run in either direction thus the sequence of operation may be from top to bottom or bottom to top as you desire. This is accomplished with transfer switches which make the machine readily adaptable to climb hobbing and regular hobbing operations.

Every possible operating convenience is included in Rigidhobber design and construction. Limit switches control length of travel and distance of rapid traverse and a safety overtravel switch is provided in case machine is operated beyond its capacity. One run button controls the machine. The main control is in the upper rear column protected from dirt and coolant.

The simplicity of operation—the rigidity of design and construction — enables operator to become expert in a short time.

Thus the Rigidhobber offers a practical, high production method for the accurate duplication of spur and helical gears —straight and helical splines.

The CLEVELAND HOBBING MACHINE *Company*

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

annealing, stress relieving and carburizing. Its direct heat chamber for heating for tool dressing, forging and bending, has opposed openings in front and back, 2 × 4½ in. On top is a tempering surface for tools and dies.

The indirect heating chamber has a "U"-shaped hearth 6 in. between ribs and 8 in. deep which can be replaced through the door. The interior is over 410 cu. in. and heats to 1,500 F. in 10 min. and 1,900 F. in 29½ min. Temperatures up to 2,500 F. are obtained in the direct heat chamber.

Non-fluctuating heat is maintained by the Barkling air relief valve, operating in conjunction with a specially designed blower which eliminates variations in pressure. Overall dimensions of the furnace are 25 in. wide, 19 in. deep and 53 in. high.

Federal dial indicator snap gage

Federal Dial Indicator Snap Gage Is Adjustable for Size

Model 1330 Dial Indicator Snap Gage, announced by Federal Products Corp., 1144 Eddy St., Providence 1, R. I., is so designed that its weight in the operator's hand rests upon a fixed, rather than a sensitive, contact.

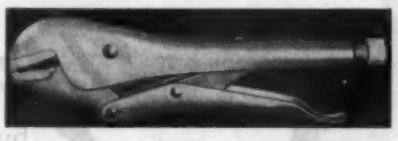
The lower anvil is retractable and can be applied to the work without danger of marking fine finishes, according to the manufacturer. The dial indicator feature is said to make it more accurate since the inspector sees rather than feels dimension variations.

The gage has a low-friction movement, which transfers the movement of the contact point to the indicator without error. An adjustable backstop locates the work in the center of contacts. It is ⅜ in. thick, not over 6 in. at longest point, weighs 15 oz. and reads in 0.0001 in.

Vise-Wrench Gives One Ton Pressure With Normal Grip

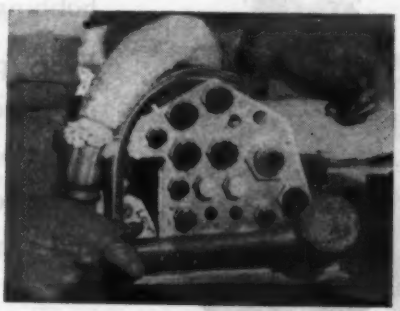
A new, improved Vise-Wrench is announced by Knu-Vise, Inc., Detroit 16, Mich. Made of alloy steel forgings, the milled teeth are welded to the stamped body and are said to possess added wear resistance; both the teeth and the body are heat treated.

The tool can be used as a portable vise to hold work, or as a pipe wrench. A locked grip can be maintained on work without the aid of hands. Normal hand grip can attain a clamping pressure at the jaws up to one ton.



Knu-Vise Vise-Wrench

Vise-Wrenches are available in two sizes: Model VG-10 in 10 in. length, weight 18 oz. and VG-7 in 7 in., weighing 13 oz.



Southern California plastic caps

Southern California Produces Plastic Hydraulic Tubing Caps

Plastic caps, designed to keep dust out of aircraft hydraulic system tubes during storage, are being manufactured by Southern California Plastic Co., 2773 West Broadway Blvd., Eagle Rock, Calif.

Designed in conjunction with Lockheed Aircraft Corporation engineers, the caps are considered important in saving life and property, inasmuch as dust settled in a stored tube might prevent operation of a relief valve or cut off a pilot's oxygen supply. The caps are said to perform this important function easily, quickly and economically.

There are three types of caps, designed to meet varying needs: snap on caps for use on beaded ends of tubing; snap on plugs, for use on flared tubing ends; and quarter lock caps for use on male fittings. The caps and plugs may be reused. They are permanently colored for size and identification, and numbered as to the size of the tube they are to fit.

Watson-Stillman Hydraulic Powdered Metal Press Ready

A new hydraulic press for briquetting parts from powdered metal is announced by The Watson-Stillman Co., Roselle, N. J. It is designed to simplify powdered metal molding operations and to give a high degree of accuracy and consistently uniform structure density in finished products. The press has a 400-ton capacity, vertical ram and a 300-ton capacity horizontal ram. It is double acting with controls and adjustments conveniently located for the operator. Continuous performance and exact duplication on production runs are assured by smooth, pulsationless pressure application, accurate stepless pressure adjustment and automatic cycle controls. Micrometer adjustment of pressure is provided on the working stroke. The mold size is 6 in. wide × 7 in. deep × 30 in. long.

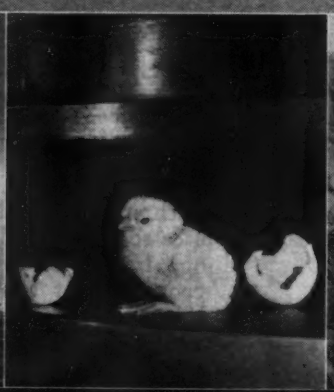
Pressure is provided by a radial piston-pump, driven by a 30 hp. motor. This machine is supplied with pushbutton, solenoid-operated pilot valve for down and forward movements of the press ram. A hand-

Watson-Stillman hydraulic powdered metal press

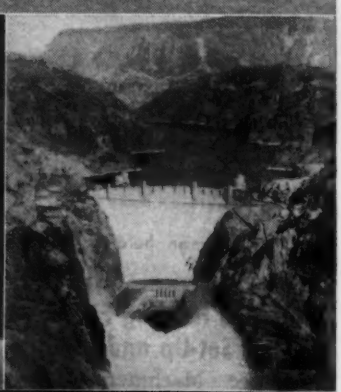
Would you believe it?

BALDWIN supplied the hydraulic elevators that raise and lower the stage of Radio City Music Hall.

BALDWIN diesel engines are used for main propulsion units on minesweepers and for auxiliary power on many other vessels.



BALDWIN testing machine of 3,000,000 pounds capacity can be controlled so as to break the shell of a hatching egg without harming the chick.



BALDWIN hydraulic turbines, 115,000 horsepower capacity, driving huge electric power generators, are installed at Boulder Dam.

Baldwin manufactures a wide diversity of products, including testing equipment for wind tunnels, steering gears for LST landing craft, hydraulic elevators for aircraft carriers, and many other machines and instruments, serving industry on which America is depending to speed final victory.

Of course, Baldwin is well known as the builder of locomotives of all types—steam, diesel-electric and electric—doing their share of the greatest transportation job in history.

BALDWIN

BLW THE BALDWIN GROUP

The Baldwin Locomotive Works, Philadelphia, Pennsylvania: Locomotive & Ordnance Division; Baldwin Southwark Division; Cramp Brass and Iron Foundries Division; Standard Steel Works Division; The Whitcomb Locomotive Co.; The Pelton Water Wheel Co.; The Midvale Co.

lever operates the return movement. Operating speeds of vertical ram are 238 in. per min. advance and return, 17.5 in. per min. pressing. Horizontal ram advance and return speeds are both 21.6 in. per min.

This press is 11 ft. 6½ in. height overall. It occupies floor space 6 ft. 2 in. × 2 ft. 7 in. Its weight is approximately 28,000 lb.

Challenge holding fixture

Challenge Holding Fixture Cuts Set-Up and Loading Time

Challenge Machinery Co., Grand Haven, Mich., has added to its line a holding fixture designed to cut down set-up and loading time. The fixture is described as being made of special analysis, semi-steel with adequate reinforcing and machined to necessary precision. It is available in three standard sizes.

ENCO Manufacturing Announces Replacement Turret Tool Post

ENCO Manufacturing Co., Dept. 76, 4522-24 Fullerton Ave., Chicago 39, Ill., announces its compound replacement turret tool post, Model CR, said to offer the utmost in tool rigidity under high speed production and to remove a possible source of chatter and inaccuracy in the compound. It is designed especially for engine and bench lathes with low center heights. Clamped rigidly on the bolt circle the CR turret mounts maximum tools and tool holders. Range of lathe swings covered is from 9 to 36 in.

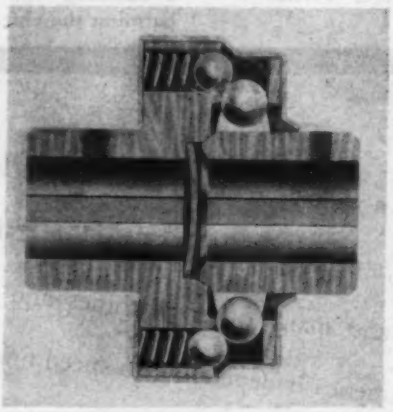
The turret block has 12 indexing positions spaced 30 deg. apart, enabling each of the 4 tools mounted in the block to perform more than one operation.

ENCO Model CR turret tool post

Rogers Casing Salt Replaces Cyanide for Heat Treating

G. S. Rogers & Co., 228 N. LaSalle St., Chicago 1, Ill., has developed a Specification No. 33 casing salt which, it is said, will satisfactorily replace sodium cyanide for heat treating. In many cases, the manufacturer reports, use of this salt has shown advantages over sodium cyanide in faster penetration of the steel, time cycle reductions, better case structure and easier cleaning.

This new product is recommended to provide case depths up to 0.009 in. and is particularly desirable for thin steel sections.



Dodge automatic coupling

Dodge Automatic Coupling is Safe, Flexible and Resilient

A safety coupling produced by the A. Y. Dodge Co., 307 S. Main St., Rockford, Ill., is said to release completely when overloaded and to reengage automatically when the power is shut off.

The coupling is described as running completely freely in the released state. These couplings embody self-aligning and flexible features and are available in five standard sizes as well as special models. The manufacturer describes the unit as being a combined safety, flexible and resilient coupling.

Gray "Slow-Down" Planer Control Boosts Production and Tool Life

A new "Slow-Down" control for a planer table, introduced by the G. A. Gray Co., 3611 Woodburn Ave., Cincinnati 7, Ohio, enables the operator easily to reduce sped when a hard spot in a casting approaches the cutting tool. When the tool leaves the hard spot — previously marked in chalk—the operator releases the button and the table resumes normal speed.

The new control is said to effect an increase in production and a saving in tool life during certain kinds of work. It is applicable to any new variable voltage planer equipments and is described as costing less than variable voltage drive equipment.

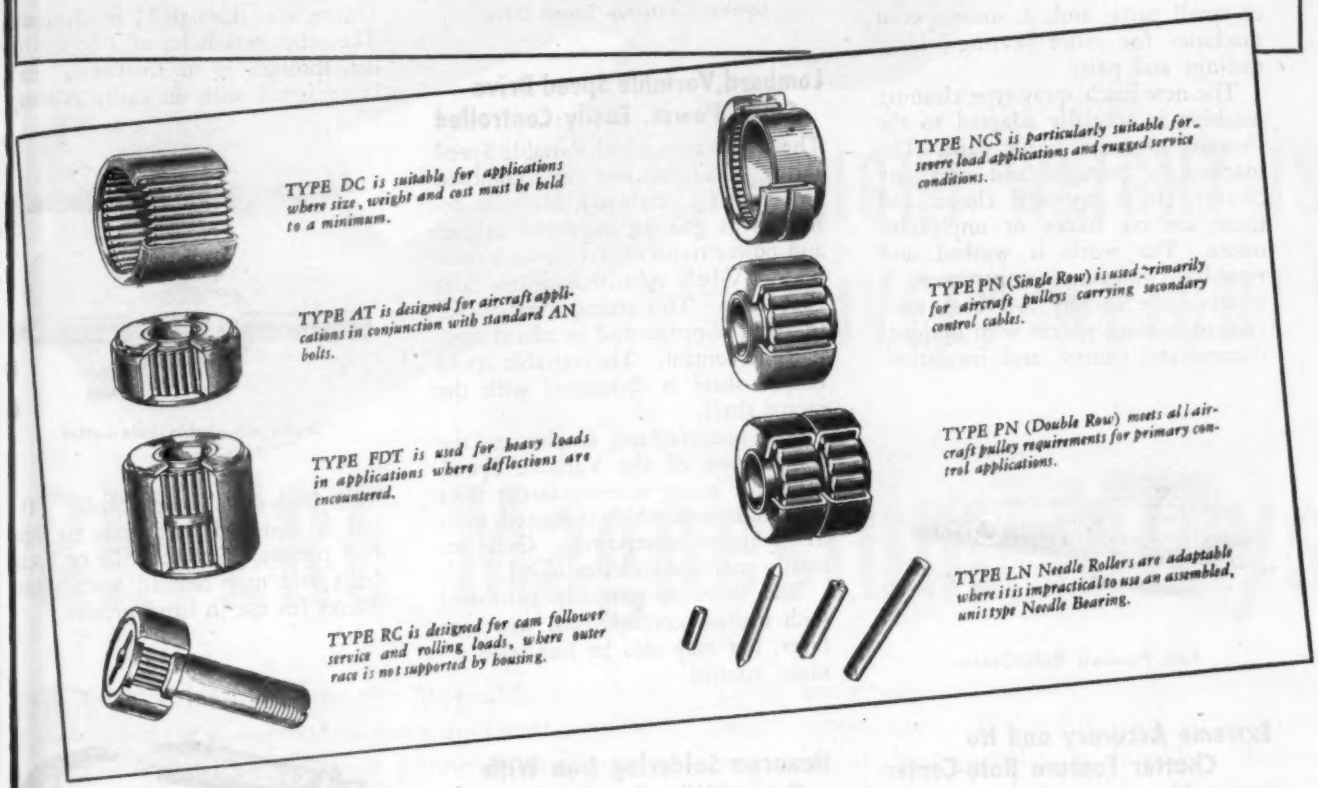
Optimus batch spray type cleaning machine

Optimus Metal Washing and Spray Cleaning Equipment

The Optimus Equipment Co. Matawan, N. J., announces the development of a new line of metal washing, cleaning and drying equipment and a new batch spray type cleaning machine specially adapted to the cleaning of large heavy parts.

The washing, cleaning and drying equipment is generally classified as Standard and Special. Standard types cover: 1. the continuous horizontal flat conveyor suitable for a series of operations and a wide variety of work; 2. the cabinet type washing and rinsing machine for large or small parts in baskets; 3. the semi-automatic in which parts are carried in drums, baskets or racks, using the hot air blast dryer; and, 4. the auto-

One of these Needle Bearings May Solve a Design Problem for You...


TYPE DC is suitable for applications where size, weight and cost must be held to a minimum.
TYPE AT is designed for aircraft applications in conjunction with standard AN bolts.
TYPE FDT is used for heavy loads in applications where deflections are encountered.
TYPE RC is designed for cam follower service and rolling loads, where outer race is not supported by housing.
TYPE NCS is particularly suitable for severe load applications and rugged service conditions.
TYPE PN (Single Row) is used primarily for aircraft pulleys carrying secondary control cables.
TYPE PN (Double Row) meets all aircraft pulley requirements for primary control applications.
TYPE LN Needle Rollers are adaptable where it is impractical to use an assembled, unit type Needle Bearing.

It may not have occured to you that there are so many *different* types of Needle Bearings—or that the completeness of the line of these modern, antifriction bearings makes them adaptable to many design requirements.

Pictured above are eight different types—all different in design yet employing the same basic design principle of a full complement of small diameter needle rollers. Each is engineered for a particular task—or combination of design requirements. Individually each offers the same characteristic advantages of compact design, small size, light weight, high capacity, efficient lubrication and low cost.

The result is that in almost any application where Torrington Needle Bearings are employed, the design problem is simplified; operating efficiency and service life are increased; manufacturing costs are reduced, and sales features are added.

Investigate for yourself how these advantages can be of assistance in your product planning. The Torrington Needle Bearing Catalog 30-A gives complete information, and our engineering staff is ready to help you with any specific design requirement.

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

"Makers of Needle Bearings and Needle Bearing Rollers"

New York, Boston, Philadelphia, Detroit, Cleveland, Seattle, San Francisco, Chicago, Los Angeles, Toronto, London, England

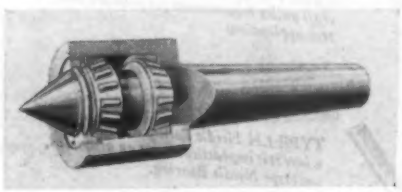
TORRINGTON

NEEDLE BEARINGS

matic turntable, equipped for two or three operations on hollow parts or larger parts in baskets or holders.

The special machines include: 1. the continuous horizontal overhead chain conveyor for multiple spray or drip operations; 2. a machine with one chain or two chains and cross bars, for one or more spray or dip operations; 3. the continuous screw, or the two-way rotating drum, fully automatic in operation, for one or more treatments of large quantities of small parts; and, 4. some special machines for roller bearings, large castings and parts.

The new batch spray type cleaning machine is specially adapted to the cleaning of large, heavy parts. The machine is portable and uses any cleaner. It is operated closed and there are no fumes or unpleasant odors. The work is washed and rinsed in the same compartment. It is adaptable to any low cost, convenient heating system with optional thermostatic control and insulation.



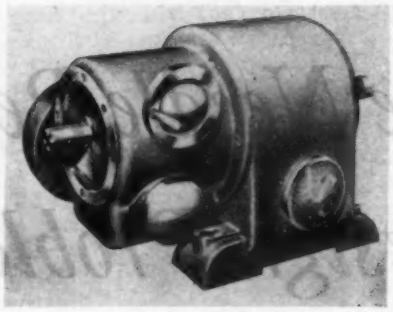
Falls Products Roto-Center

Extreme Accuracy and No Chatter Feature Roto-Center

Extreme accuracy and positive elimination of chatter are the outstanding features attributed to the newly developed live cener—the "Roto-Center"—announced by Falls Products Co., P. O. Box 64, Milwaukee, Wis. It is intended primarily for use in grinder and lathe tail stocks for replacement of dead centers that failed to stand up under the high friction of increased speeds and loads of modern production.

To obtain accuracy of zero eccentricity, the spindle point of this new design is ground in its own bearings after assembly to guarantee absolute truth. Removal of all internal play and preloading the bearing through a threaded retaining ring prevent chattering. The provision of compensation for bearing wear by tightening up on the retaining ring, makes possible sustention of initial preloading and non-chattering throughout the life of the center.

A heavy-duty seal for repelling chips, dirt and cutting oil.



Lombard Variable Speed Drive

Lombard Variable Speed Drive Saves Power, Easily Controlled

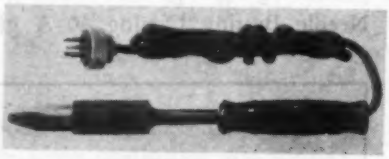
The newly announced Variable Speed Drive, manufactured by Lombard Governor Co., Ashland, Mass., is described as gaining improved control and power transmission through combining V-belt control and low-ratio gear drive. This arrangement is said to avoid slippage and to afford finer hairline control. The variable speed output shaft is concentric with the motor shaft.

The manufacturer emphasizes the compactness of the Variable Speed Drive, it being scarcely larger than the motor with which it is used, even in the higher horsepowers. Gears are totally enclosed and run in oil.

The drive is normally furnished with manual control hand wheel or lever, but may also be had with remote control.

Hexacon Soldering Iron With Ground Wire Protects Operator

Electric soldering irons equipped with a ground wire, to minimize the possibility of the operator receiving a shock and to prevent blown fuses and damage to electrical apparatus, are being manufactured by Hexacon Electric Co., 135 W. Clay Ave., Roselle Park, N. J. A three-wire cord set with three-prong attachment plug is used to accomplish the grounding. Naturally, use is limited to locations with three wire outlets.



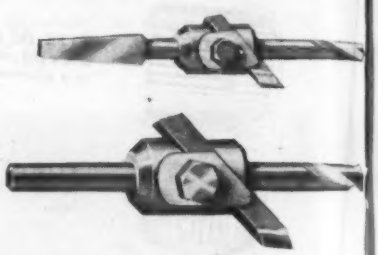
Hexacon iron with ground wire

This equipment is available on order in various models of screw tip, plug and hatchet irons.

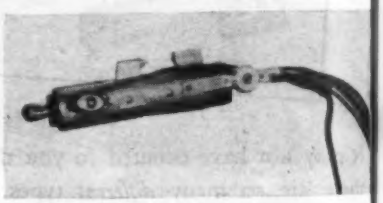
Bruno Announces Adjustable All-Purpose Hole-Cutting Tool

An all-purpose adjustable hole-cutting tool is announced by Bruno Tools, Beverly Hills, Calif. It is described as quickly cutting smooth holes in wood, steel, brass, hard rubber, aluminum, fibre, plastics and problem materials which might necessitate use of torches or other expensive equipment.

One model cuts holes of ⅝ to 1¼ in. dia., through ⅛ in. thickness. The other cuts holes of 1 to 2½ in. dia. through ⅜ in. thickness. Each is equipped with an easily re-sharpened high-speed steel blade. The tool is designed to operate in light drill presses, portable drills or breast drills and may be had with square shanks for use in hand presses.



Bruno adjustable hole-cutter

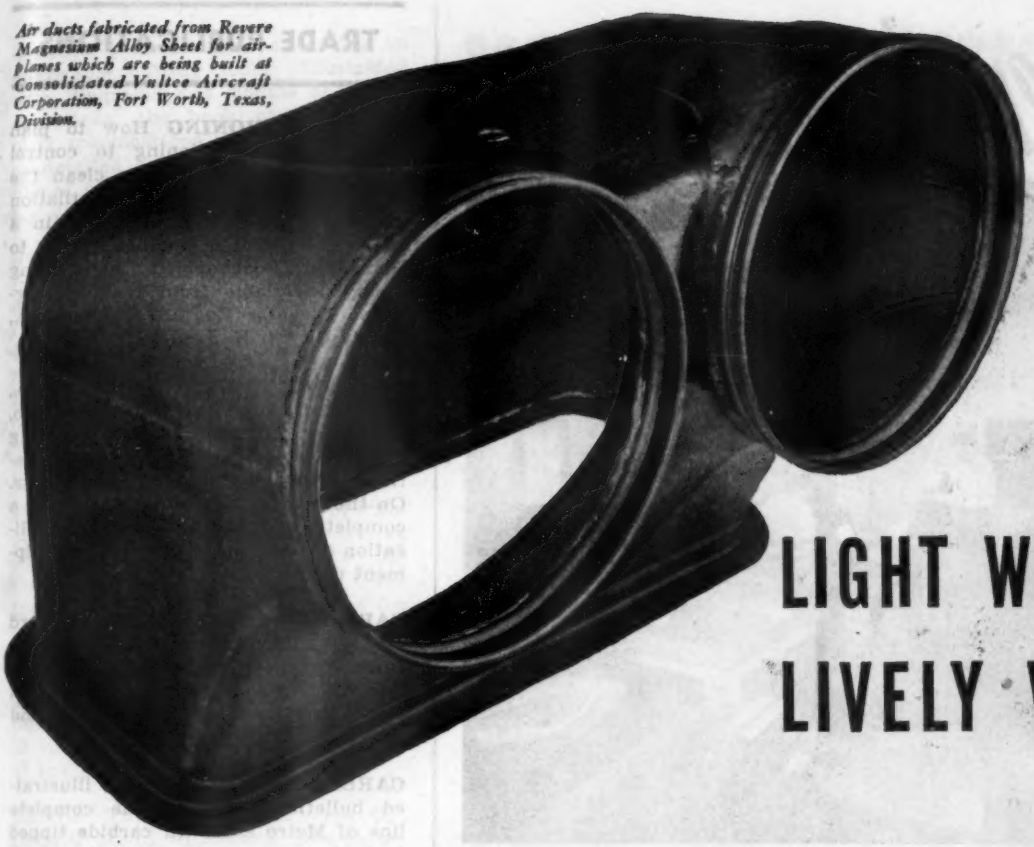


HY-MAC Hydro-Squeeze Gun

HY-MAC Hydro-Squeeze Gun Exerts Half-Ton Pressure

A portable 1½ ton capacity hydraulic press with offset platen and ram identified as "HY-MAC" Hydro-Squeeze Gun and built for pressures to 1,000 psi., is announced by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich. The offset platen and ram are constructed to accommodate numerous special adaptors for various operations, such as pressing bushings and pins, riveting and dimpling. It is described as especially able to reach hard-to-get-at places.

A standard HY-MAC hydraulic power unit complete with pump, motor, tank and valves generates the power for operation of the gun.



Air ducts fabricated from Revere Magnesium Alloy Sheet for airplanes which are being built at Consolidated Vultee Aircraft Corporation, Fort Worth, Texas, Division.

LIGHT WEIGHT IS LIVELY WEIGHT!

REVERE Magnesium Alloys

DON'T be misled by the inevitable fact that thus far the use of magnesium for structural purposes has been largely confined to the airplane. As more and more of this remarkable light metal becomes available (and more is being released every day) you will find magnesium creating the new light metal age, in which a great many things that move will do so more quickly and economically and easily because magnesium is used in them.

Remember that it costs money to move anything—trucks, trailers, elevator cages, railroad cars, buses, *anything.* And it costs money to ship to, and move around a plant, the materials of which they are made. It takes effort to move such common articles as vacuum cleaners, hand tools, portable typewriters, chairs. Weight reduction will be *so* important after the war!

Revere Magnesium Alloys are available now in the form of sheet and plate, rod and bar, tubes and shapes, forgings and forging stock. The Revere Technical Advisory Service will gladly assist you in obtaining magnesium's maximum advantages...Write for your complimentary copy of the new 32-page booklet, "Revere Magnesium Alloys and the Light Metals Era."

THE FOUR REVERE MAGNESIUM ALLOYS

Working Characteristics	"M"	"FS-1"	"J-1"	"O-1"
FORMABILITY	Good	Excellent	Fair	*
STRENGTH	Good	Good	Excellent	Excellent
WELDABILITY	Excellent	Good	Excellent	Excellent
DEEP DRAW	Excellent	Good	Fair	*
FORGEABILITY	Excellent	Excellent	Excellent	Excellent
MACHINABILITY	Excellent	Excellent	Excellent	Excellent

*Heat-treatable extrusion or forging alloy

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...before this stamp of Precision appears on Turner Gauges

THE VERY last operation performed on any Turner Gauge before packaging is the application of the Turner Stamp, which you see reproduced above. Prior to this, every Turner Gauge has been checked and double checked in our air conditioned, temperature controlled inspection room. *It is your guarantee that all checking surfaces are accurate to your specifications.*

★ *We make cylindrical plug gauges, Plast-O-Lock plug gauges, cylindrical ring gauges, special flush pin gauges, solid type snap gauges, Master Discs, and built-up gauges.* ★

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY

2625 HILTON ROAD FERNDALE 20 MICHIGAN

Pictured below: Plug Gauge, Ring Gauge, Snap Gauge, Flush Pin Gauge and Built-up Gauge

TRADE PUBLICATIONS

AIR CONDITIONING How to plan postwar air conditioning to control temperature and humidity, clean the air, and provide adequate ventilation and air circulation is discussed in a 16-page illustrated booklet "How to Plan Your Postwar Air Conditioning Today" available from the Westinghouse Elevator Co., 150 Pacific Ave., Jersey City 4, N. J.

AIR EQUIPMENT The Bellows Co., 861 E. Tallmadge Ave., Akron 10, Ohio, is offering a photo facts file consisting of 25 photographs showing installations of its equipment in many plants. On the reverse side of each photo is a complete story of the specific application as well as the cost of the equipment used.

CARBIDE CUTTERS The M. A. Ford Mfg. Co., 732 W. First St., Davenport, Iowa, has prepared a bulletin on its line of carbide rotary cutters. Each model is illustrated and sizes and prices included.

CARBIDE TOOLS A 6-page illustrated bulletin describing the complete line of Metro standard carbide tipped tools for use on the majority of all turning, facing and boring operations on all types of steel, cast iron, bronze, aluminum and non-metallics has been released by Metro Tool and Gage Co., 4240 Peterson Ave., Chicago 30, Ill. The bulletin is complete with sizes and prices.

CHUCK A bulletin that describes and illustrates the four standard setups on "Jiffy Jig" for drilling, milling, boring and grinding, has been issued by the Monarch Governor Co., 1832 W. Bethune, Detroit, Mich., manufacturer of this new type lever-operated chuck.

CLAMPS. An 8-page illustrated catalog P-1 on clamps and fittings has been prepared by the Punch-Lok Co., 321 N. Justine St., Chicago 7, Ill. It contains complete technical data on the entire line to aid in the application and proper use of the Loking tool for connecting male and female fittings, nipples, menders, or pipe to hose.

CLAMPING DEVICES A catalog showing toggle-action clamping devices has been printed by Knu-Vise, Inc., 2200 Eighth St., Detroit 16, Mich. Bound in plastic, the catalog contains 58 pages showing reproductions of the full line of Knu-Vise products including clamps of four types, "C" clamps, pliers, and wrenches, together with mechanical drawings showing dimensions of the various sizes and descriptions. A table of recommended pressures and a price list are included.

CUTTING TOOLS The Robert H. Clark Co., Beverly Hills, Cal., has an-

nounced publication of a catalog on adjustable cutting tools. Illustrated with diagrams and photos of actual operations, the book contains complete specifications and prices as well as detailed descriptions of the entire line of cutting tools. Ask for Catalog No. 44.

FINISHING A new method of deburring and finishing metal parts and castings is described and illustrated in a folder entitled "Slash Time and Cost with Roto-Finish" available from the Sturgis Products Co., Sturgis, Mich. The booklet shows how hand methods for deburring and finishing are eliminated and performed mechanically by the new process.

FLUXES The complete line of "Superior" fluxes is described in a catalog offered by the Superior Flux Co., 913 Public Square Bldg., Cleveland, Ohio. Included in this line are 20 fluxes for welding, brazing, silver soldering, soft soldering and low temperature alloy welding of ferrous and non-ferrous metals and alloys. For each flux listed there is included a detailed statement of its characteristics and a schedule of list prices.

GAGES The N. A. Woodworth Co., Detroit, Mich., announces publication of its Gage Catalog No. 44-G featuring three exclusive new gage developments. These are the Limitrol gage which performs six visual inspection operations in one, Carboloy gages with the Woodworth exclusive segmented shank, and gages of cast Stellite alloy. This catalog lists specifications under H-28 Standards in addition to the H-25 Standards which have been in use since 1938.

HYDRAULIC EQUIPMENT A bulletin describing hydraulic equipment for the process industries has been published by The Watson-Stillman Co., Roselle, N. J. It covers a comprehensive line of hydraulic presses, pumps, and accumulators, as well as forged steel fittings and valves. Copies of Bulletin 130A will be sent if requested on company letterhead.

HYDRAULIC PRESSES Bulletin VJI-44 available from the Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, Mich., describes its expanded line of improved "Junior" hydraulic presses intended primarily for light and medium duty assembly and broaching work. The bulletin gives specifications, descriptions and photos of both bench and base types. New accessories are also covered.

LUBRICATION Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio, has revised Bulletin No. M-1084-2. Additions include complete information on filters for machines which use these devices and detailed specifications on all lubricants for the company's products. The first section of the book gives general instructions and is then followed by specific and

Now... REASONABLE DELIVERIES
ON ALL ELLSTROM GAGE BLOCK SETS

You can now order your set of the famous Ellstrom CHROMIUM PLATED Gage Blocks and we can promise you reasonable delivery. Our stepped up delivery schedule applies to either "Working", "Inspection" or "Laboratory" sets. Just drop us a note asking for precise information.

Yes, all Ellstrom-made Gages are CHROMIUM PLATED to give them very superior wearing qualities. These gage blocks by actual test wear many times longer. It's the finest gage block that money can buy . . . and solidly backed by a family tradition of fine precision gage making.

Ellstrom Chromium Plated Gage Blocks offered individually or in complete sets in three classes: WORKING Sets with guaranteed tolerance of ±.000008" INSPECTION Sets with guaranteed tolerance ±.000004" LABORATORY Sets with guaranteed tolerance of ±.000002".

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

Ellstrom

Chromium Plated Gage Blocks represent the highest achievement in precision gage block manufacture.

Now is the Time to be Practical About Your Steel Inventory

Industry has received repeated warnings that war business cannot last forever. The time will come . . . soon, when hostilities will cease and war contracts will be drastically cut or cancelled. It is wise, therefore, to adopt a conservative inventory policy on steel which may not be readily convertible when peace time production is resumed.

You are being urged from all sides to buy steel only as you need it. In this way steel mills are able to concentrate production on steels currently needed and you avoid the risk of obsolete stocks.

Steel warehouses today offer a much wider selection than at any time since the start of the war. A nation-wide organization such as Joseph T. Ryerson & Son, Inc., supplying thousands of items from convenient stocks, is your surest source of steel. You can depend on Ryerson for all types of steel in any reasonable quantity.

Call Ryerson When You Need Steel

Every type of steel from stainless to structurals is immediately available from Ryerson stock. Just reach for the phone and call any one of the eleven conveniently-located Ryerson service plants. Our operators will connect you at once with an experienced service man who will see that you get the steel you need—when you need it.

JOSEPH T. RYERSON & SON, INC. Steel-Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

QUICK, DEPENDABLE SHIPMENT

detailed instruction for milling, grinding, broaching and lapping machines.

MATERIALS HANDLING Rolock, Inc., 1350 Kings Highway, Fairfield, Conn., has produced its "Processing Carriers" Catalog. The 24-page book illustrates and describes more than 100 custom-built metal baskets, trays, crates, barrels, boxes and fixtures that have been designed to solve specific problems for better handling of metal parts. The carriers are sectionalized both under heat-treating with all its various processing operations, and under design types of carriers.

PNEUMATIC TOOLS The Master Tool Co., Inc., 56 and Herman Ave., Cleveland, Ohio, has prepared a catalog on its line of pneumatic tools. Besides illustrations and descriptions of the various models, the book includes specifications, prices, check lists and other valuable information.

PRESSES Bulletin No. 520-A, available from the Watson-Stillman Co., Roselle, N. J., describes new bushing presses for railroad shops. It covers a full line of self-contained, quick-acting, oil-operated presses for inserting and removing connecting rod bushings, driving box brasses and for bending or straightening rods, levers and other similar devices. Requests must be made on company stationery.

RESISTANCE WELDING Written for the non-technician, the booklet "Tomorrow's Production Today by Resistance Welding" is a brief review of what resistance welding has accomplished, what it is doing to speed the war effort, and what its future possibilities for postwar metal fabricators will be. Those interested in the use of resistance welding as a fabrication method may obtain a copy of this Bulletin No. 101 by writing the Resistance Welder Manufacturers' Assn., 505 Arch St., Philadelphia 6, Pa.

RIVETS Pheoll Mfg. Co., 5700 W. Roosevelt Road, Chicago 50, Ill., has published a 12-page illustrated manual on Hi-Shear rivets, a recent development of North American Aviation, Inc. The book covers the outstanding features, advantages, gun and squeezer methods of installation, progressive forming, lengths and methods of removal.

SHEET STEEL Design and fabricating advantages of Armco cold rolled Paintgrip, a special surface-treated sheet steel that is given an electrolytic zinc flash and then Bonderized at the mill, are presented in a booklet just prepared by The American Rolling Mill Co., Middletown, Ohio. Data is given on physical properties, corrosion resistance and paint life. Recommended practices for welding, soldering and finishing are described.

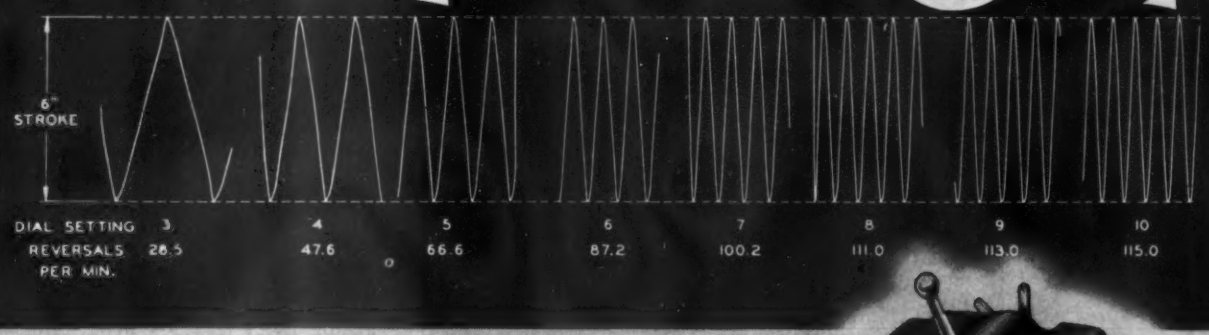
THERMOCOUPLES An enlarged edition of its Thermocouple Data Book and Catalog has been issued by Wheel-

For Machines Requiring Continuous Reciprocating Cycles:

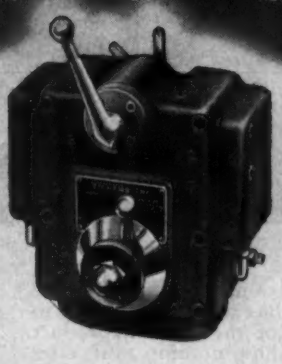
OVERRIDE PRACTICALLY ELIMINATED

SMOOTH REVERSALS AT ALL SPEEDS

Note Uniform Length of Stroke



VICKERS "RECIPROCATING CYCLE" CONTROL PANELS



Representative of More Than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

This is a complete self-contained control unit for grinding machines, honing machines, or any process requiring a continuous reciprocating cycle.

The curves reproduced above were accurately made by a stylus attached to a reciprocating head and tracing upon a recording mechanism. Note uniform stroke length regardless of large changes in head or table speed. Throughout the test the setting of reversing trip dogs remained unchanged. An integral Vickers Hydrostatic Compensator makes flow rate (and therefore rate of reciprocation) independent of variations in resistance encountered. Similar tests and many installations show that at other speeds, loads and stroke lengths the same smooth reversals and accurate stroke length control are maintained.

Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

VICKERS Incorporated

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The costs of material handling are known to be excessive—they add to the price of the finished product but contribute nothing to its sales value. Cut these costs and you gain a tremendously important competitive advantage.

Conveyors and conveyor systems, adapted to your particular operations, speed up material and commodity handling activities, pull handling costs down to an economical level, speed the flow and movements of production. Conveyors handle a wide range of commodities — parts, packages, units, cartons, cans, bottles, barrels, bundles, drums, boxes. They are built in light, average, or heavy-duty types for either portable or stationary use—in a wide variety of sizes, styles and lengths.

Standard builds roller, belt, chain, slat, push bar conveyors; spiral chutes, tiering and lifting machines, portable pilers, and pneumatic tube systems, for every type of material handling and is equipped by experience and facilities to reduce your handling costs with the right type of equipment. Get the profitable answer to your material handling problem today. Write us for Bulletin No.AM-124

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co Instruments Co., Harrison and Peoria Sts., Chicago 7, Ill. This Bulletin S2-5 consists of 40 pages and describes products, gives prices and offers recommendations for thermocouple users. It includes selection data, millivolt tables on the various types of thermocouples, temperature conversion tables and a fraction-decimal equivalent chart.

NEW BOOKS

FACTS ABOUT FOREMEN—*44 pages. Published by the Labor Relations Institute, 1776 Broadway, New York 19, N. Y. $1 to members; $1.50 to others.*

Published to give aid in making supervisors actually, as well as nominally, a part of management, this book begins with a recommendation that a specification or requirement sheet be drawn up for every foreman's job. A sample job description and a questionnaire for determining which points should be covered in describing each supervisory position, are included.

According to the report, job analysis adds dignity to the foreman's job, and acquaints executives, employees and fellow supervisors with each foreman's requirements and responsibilities; it also facilitates the preparation of a practical organization chart, protecting the foreman from the hazards and confusion of reporting to more than one boss.

The report suggests ways and means of building foreman morale and improving the selection and training of supervisors.

•

MANUAL OF MACHINE SHOP PRACTICE—*By Otis Benedict, Jr., assistant professor, department of shop practice, Pratt Institute. 249 pages. Published by the McGraw-Hill Book Company, 330 West 42 St., New York 18, N. Y. $1.75.*

This book is not devoted to machine tool operation. Rather it is a presentation of material helpful to the student pursuing a course in engineering shop practice.

For example, the author at some length discusses how to find cutting speeds, considering both rotating and reciprocating tools. Then he goes into the time of machining with appropriate examples and simple formulas. Screw threads and cutting various threads with simple and compound gearing are adequately covered. Taper calculations and taper turning, indexing and index calculations are explained. Tolerances and allowances, precision measuring devices, machine tool analysis, press tools are given chapters.

On the whole it can be said that here is one book that covers the subject matter in simple, understandable English. Some of the topics can be

grasped by the student in a fourth the time required to wade through poorly-written sections found in some other books.

SEEN and HEARD

Keeping Track of Contracts

WHEN A PLANT has a number of contracts for parts, some of which bear close resemblance to each other, it isn't always easy to prevent confusion in the shop. Not that parts are likely to get mixed, but when a contract is completed or cancelled, there may be odds and ends left over that are not discovered immediately.

One good sized shop which has a number of outside contracts, resorts to color to keep them from getting mixed up. Castings, forgings or other parts for each contract are painted a distinctive color. All special fixtures and tools which belong particularly to that job are also painted the same color. Yellow, blue, red, green and other distinctive colors are used and effectively prevent confusion.

Then when the "yellow" contract is completed all castings, fixtures, tools, gages, etc. which are painted yellow are gathered in one place to be removed or disposed of as the agency for whom they are being made, may direct. This is much easier for all concerned than depending on tags or other markings which require close examination.

Brazing Methods for Tools and Products

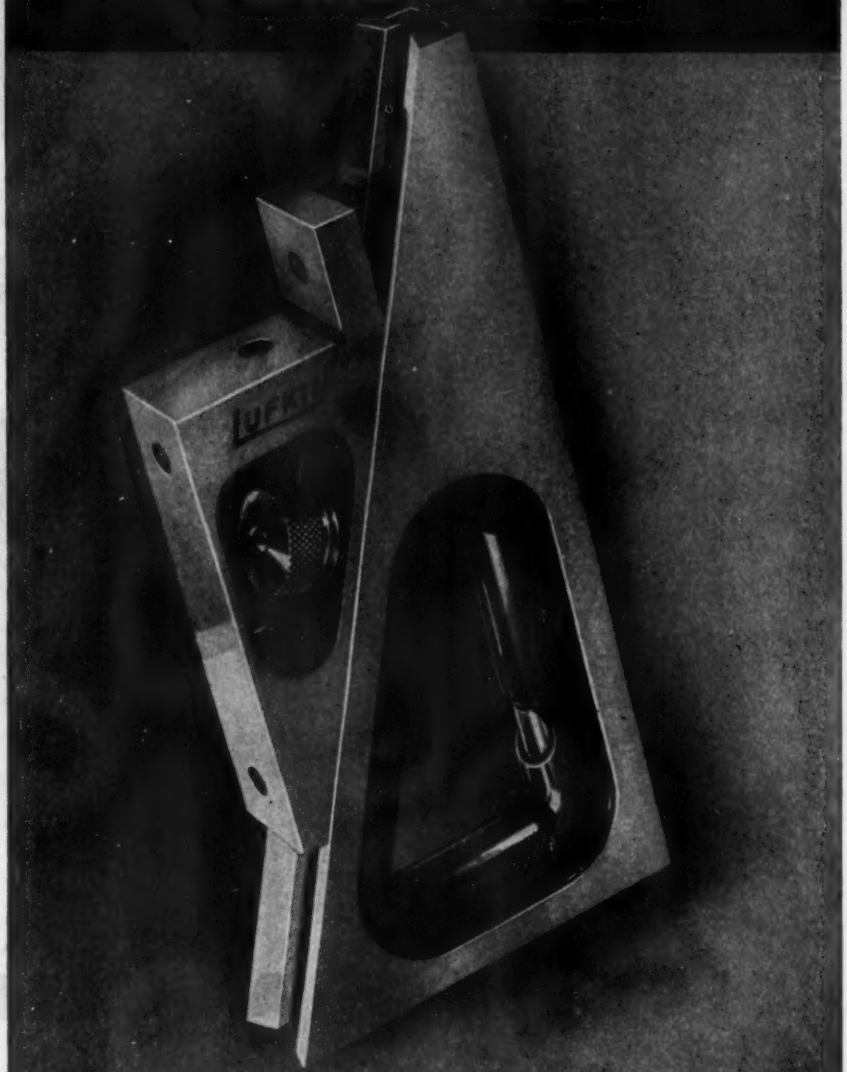
BY JOHN E. HYLER

ONE INTERESTING development during recent years has been that of brazing carbide tips on cutting tools. Furnaces have been designed particularly for brazing single-point tools and equipment for brazing multi-tipped tools is also available.

In brazing products on which oxidation is not desired, it is necessary that the atmosphere as well as the temperature of the brazing furnace be carefully controlled. Furnaces making this possible are readily available, and either batch or continuous equipment for bright brazing with copper is now found in operation.

Brazed work that can be most readily placed into, or carried through the brazing furnace on trays, has been given close attention. One type of tray that has been in use for this purpose is made from a flat wire of high nickel alloy. Trays made of this material, when properly designed, have been found to keep shape at the high temperatures at which they are used.

LUFKIN MASTER PLANER GAGE



HANDLES A WIDE VARIETY OF JOBS

The precision-built Lufkin Master Planer Gage is designed to not only serve better as a planer gage, but it is adaptable to a great variety of other jobs for which the ordinary gage is unsuited. It can be used with gage blocks in building up work on surface plates. It can be used with a Sine Bar in grinding angles. It can be used with an indicator to transfer measurements. It can be used as an adjustable parallel, and it can be used to set cutting tools. The Lufkin Master Planer Gage is truly a "Master" tool. Settings range from ⅛" to 6½" and with the extension the range increases to 9". Write for complete Lufkin Catalog.

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FILES for ALUMINUM

THE tremendous use of aluminum in aircraft and other war equipment has developed great possibilities for this popular metal. Peacetime manufacturers will continue its use in large quantities and a wide variety of applications. Tomorrow's tools for working aluminum and aluminum alloys will have many special designs, features or qualities. In files, Nicholson has perfected two distinctive types:

Nicholson Super Shear File — a recently developed curve-tooth file that *"smooths as it roughs."* Its milled-in "razor-sharp" cutting edges can "plane" down a piece of aluminum in amazingly fast time, with the final stroke leaving the surface scratchlessly smooth. Excellent also for plastics, brass, bronze, babbitt, cast iron and annealed tool steel. (Special Technical Bulletin available for requests.)

Nicholson Aluminum "Type A" File—a special cut file combining moderate cutting speed with good finishing qualities. Deep, "open-throat" upcut and fine overcut break up the soft aluminum filings, permit file to clear itself, overcome chatter, and prevent taking too large a bite.

These and hundreds of other file types, cuts and sizes for industrial uses are obtainable through mill-supply houses — all under the sweeping Nicholson guarantee of *Twelve perfect files in every dozen.*

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EXAMPLE OF *Service*:

In a recent letter, a prominent industrial manufacturer writes: "In a turret lathe, which usually required a change of tools after every sixth piece, your Chillo Cutting Oil has increased tool life more than 300% and improved finish." For another "Example of Service" write for your *free* copy of METAL CUTTING FLUIDS—26 pages of helpful information. Address: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

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and *Cities Service* means good service!

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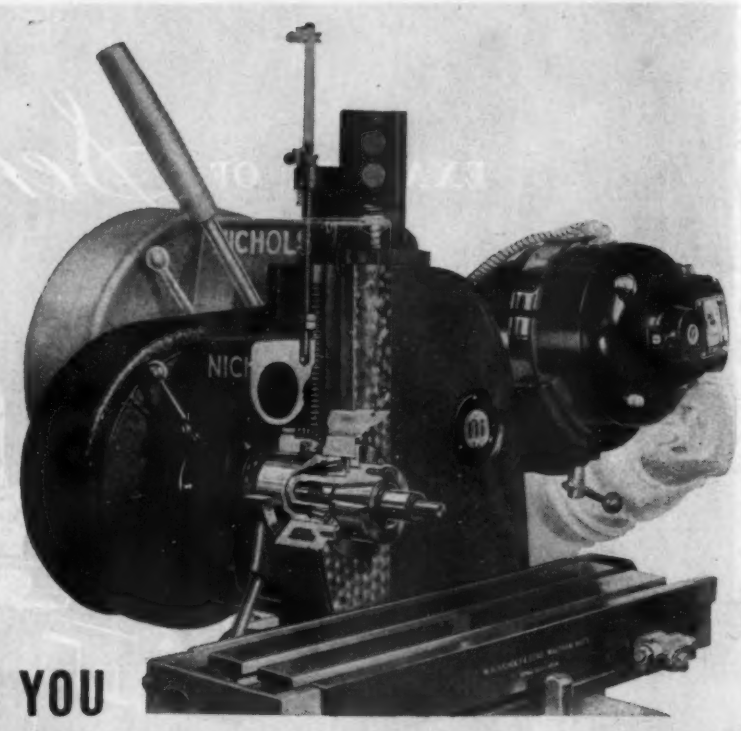
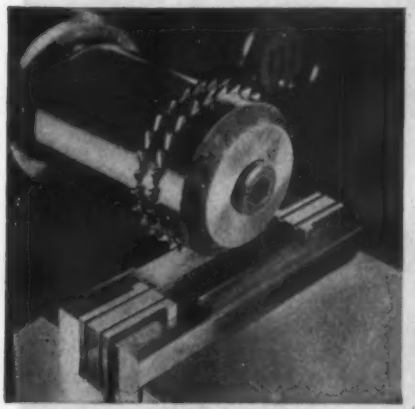
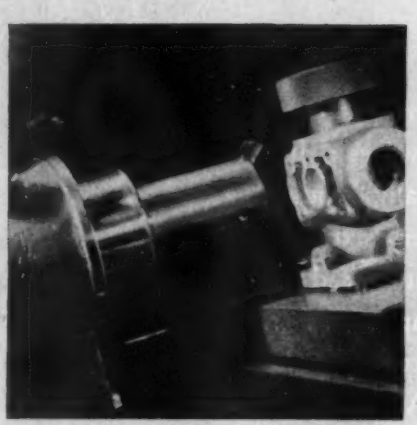
THE *BUSY* MILLER



HOW IT CAN WORK FOR YOU

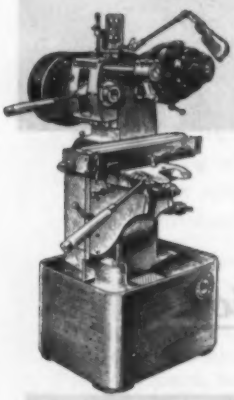


Milling Two Intersecting Slots, two up, to a perfect intersection. How else would you do it? Note the rugged tool used.



High-Speed Fly-Cutting of aluminum or magnesium. Tungsten carbide cutters are used, made in the shop with standard tool-bits.

Heavy Hand Milling, with staggered-tooth cutter and heavy vise. Precision to "tenths" or heavy production suit the Nichols Miller.



The Nichols Miller has a knack for keeping busy around the shop. It takes on dozens of high-speed machining jobs, even those normally delegated to heavier, costlier millers. And it's not unusual to see it doing the work of precision boring machines, lathes and grinders more economically...*to tolerances in "tenths."*

Visualize this multi-purpose flexibility at work on your production line or in the toolroom. Then consider these *plus* factors: rise-and-fall spindle which brings the cutter to the work...compactness and ease of set-up...lower-cost-per-piece-milled.

Investigate the Nichols Miller for your reconversion needs.

FREE BROCHURE demonstrates utility of Nichols Millers. Write for your copy today.

THE NICHOLS MILLER

"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

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For
CLEAN, DRY AREAS
Standard open-type induction motor

For
WET, EXPOSED AREAS
Splash-proof, drip-proof induction motor

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DRY, DUSTY AREAS
Totally enclosed, fan-cooled induction motor

Uni-Shell MOTORS ARE EASY TO SHIFT

THEY SPEED MACHINE TOOL RELOCATION

Is the relocation of motor-driven equipment a tough problem? Will new sites require other types of motors because of the different kind of work to be done? Will those new locations present a change from a dry atmosphere to one that is damp, from clean to dust-laden air?

In any case, R & M Uni-Shell Motors can make the change-over job a lot easier. That's because they're interchangeable. All critical motor dimensions on any one frame size are exactly the same. Uni-Shell Motors, whether they be open-type, splash-proof, or totally enclosed, will all fit a single mounting. And that goes whether they're polyphase, single-phase or direct-current.

Yes, the job of getting set to meet that new competition can be made easier. An illustrated, 20-page booklet on R & M Uni-Shell Motors contains information that will help. A copy is yours for the asking. Send for your copy of Bulletin 1845, today.

SHIPMENT NOW!

Ample stock on most types of integral motors on hand as this goes to press. Wire or phone your inquiry.

ROBBINS & MYERS • INC.
MOTOR DIVISION, SPRINGFIELD, OHIO
HOISTS & CRANES • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878

Specify screws with the PHILLIPS RECESSED HEAD for Plastic products

TO SPEED UP ASSEMBLY . . . TO IMPROVE APPEARANCE . . . TO PREVENT SPOILAGE

Faster screw driving that cuts assembly costs is assured when you specify *"Screws with Phillips Recessed Head."*

Scientific centering of driving force in the Phillips Recess eliminates all the handicaps to screw driving speed: the fumbling, wobbly starts . . . slant-driven screws . . . damaged screw heads . . . marred parts. Screws can be driven into plastics, metal or wood with less effort. Workers can speed up . . . need not worry about driver skids. Spiral and power driving becomes practical. Assembly speed often increases as much as 50%.

Economy also results from a reduction of rejects. Elimination of screw driver skids ends a common cause of marred surfaces and damaged parts. Also, it stops the injuries to workers' hands that result in lost time.

A Sales Feature! The ornamental Phillips Recessed Head becomes a worthwhile sales feature wherever screw heads "show". Not only does it look better, but it never carries a burr that may "snag" hands or clothes. People like it.

Cost Less To Use! Compare the cost of driving Phillips and slotted head screws. You'll find that *it actually costs less* to have the many advantages of the Phillips Recess.

KEY TO FASTENING SPEED AND ECONOMY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit". Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving – Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

Better Fastenings – Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

24 SOURCES

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Pawtucket Screw Co., Pawtucket, R. I.
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Shakeproof Inc., Chicago, Ill.
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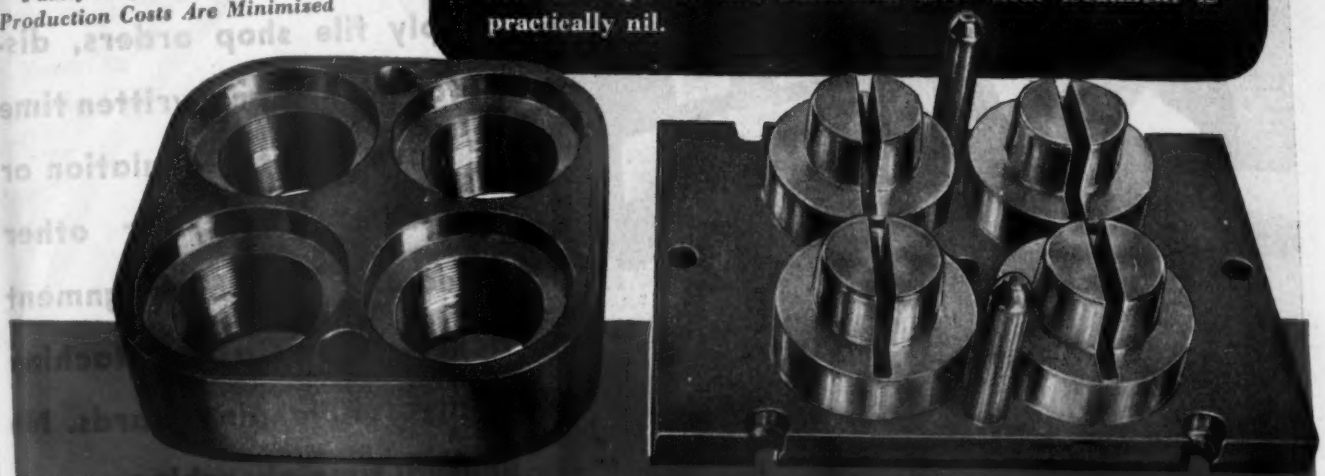
Wolverine Bolt Co., Detroit, Mich.

Pictured is a 7" x 7" x 1⅞" compression mold die of *Speed Treat* plate, used on a 60-ton press for making ordnance parts. Cavities are 3" dia.; wall between cavities .250"; outer walls .375". Note split construction of male die heads which would be impractical in tool steel (because of tendency to crack), yet over 500,000 impressions have so far been made from a similar set of *Speed Treat* dies. Female die must be removed from press after each impression to remove finished parts. Smaller metal section and lighter weight of *Speed Treat* dies is liked by women operators. *Speed Treat* replaced tool steel costing three times more, yet machinability and finish of *Speed Treat* are far superior and distortion after heat treatment is practically nil.

***Speed Treat* Savings**

66% Lower Material Cost
Better Machinability and Finish
Weight Is Reduced
Better Heat Treatment Response (pack hardening produces an .050" case and a uniform hardness of 61-62 Rockwell "C")
Heat Treatment Distortion Is Negligible
Danger of Die Breakage Due to Faulty Alignment Is Eliminated
Production Costs Are Minimized



Speed Treat Plate Is The Basic Steel for the Tool and Die Industry

Speed Treat **steel plate lends itself to economical production of plastic dies, all types of mechanical rubber molds, many types of blanking, drawing and forming dies, roller dies, brake dies and miscellaneous jigs and fixtures.**

A .50 carbon *free machining* hot rolled steel plate, *Speed Treat* affords high physical and good hardenability properties formerly found only in expensive grades of special analysis steel.

High tensile strength, free machinability, ready hardenability and constant uniformity are features of Speed Treat plate. It responds excellently to all types of heat treatment.

If you are still tooling up on war jobs or planning your postwar tool and die production, try out *Speed Treat* carbon steel plate now to learn of its many superior economy values. *Speed Treat* costs only one-third as much as water hardening tool steels.

Send for Catalog No. 1243 and the name of your local *Speed Treat* plate distributor

W. J. HOLLIDAY & CO.
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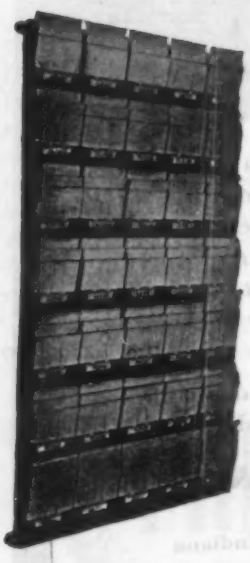
Quality Controlled Speed Case and Speed Treat Steel Is Available in All Common Plate Sizes

SIMPLIFY YOUR *Machine Loading, Scheduling, Dispatching*

Simply file shop orders, dispatch orders, pre-written time or move tickets, tabulation or "key-sort" cards, or other scheduling or job assignment tickets on McCaskey Machine Control or Planning Boards. No unusual time-absorbing procedures for personnel to master.



Many thousands of McCaskey machine control units are in use today, both for centralized machine loading and scheduling and departmental planning and dispatching. The status of each machine controlled is apparent at a glance — the job running, whether material is available for the next job to be run, other jobs scheduled, etc., etc.

The normal procedure, most frequently followed, is readily modified to suit specific needs. Numerous installations have been made in recent months without a single change in the factory forms already in use.

The system is easily made an integral part of production progress follow-up that is most effective in the control provided and surprising in the small amount of clerical work required. Accurate cost data also may be provided with a minimum of effort simply by including an extra copy of carbonized time tickets.

One eastern company, notable for its construction of specialized equipment to both the Army and the Navy, controls 3675 machines and assembly units in three plants on McCaskey Machine Control Boards. No modifications or additions to existing factory forms or records were required.

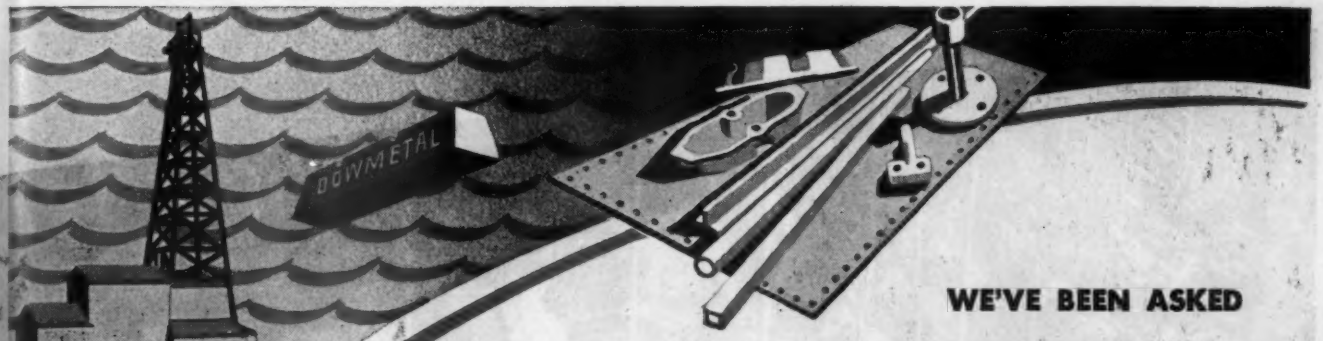
Don't delay preparations for the transitional period and for complete conversion. Write today for further information — or, without obligation, for the suggestions of one of our Industrial representatives.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL



WE'VE BEEN ASKED

THIS ABOUT MAGNESIUM:

How complete are Dow services for the magnesium user?

Dow is the pioneer and major producer of magnesium . . . the principal developer of its alloys and fabrication techniques . . . and the leading sponsor of its widespread application in many fields of industry. So it is only logical to consult Dow relative to any phase of the usage of the lightest of all structural metals.

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- Extrusions: Bars, Rods, Tubing, Special Shapes
- Sand Castings, Permanent Mold Castings, Die Castings
- Construction of Welded and Riveted Subassemblies
- Sheet, Plate and Strip
- Technical Service

The broad range of Dow magnesium activities *begins* with the extraction in large quantity of the virgin metal from Michigan brine and from the waters of the sea . . . it *includes* production of a complete line of Dowmetal Magnesium Alloy ingots and an accompanying line of fluxes and protective agents . . . it *extends* to complete mill and foundry facilities for cast and wrought products and a jobbing fabrication shop for stamping, drawn parts and assemblies . . . all *supplemented* with the knowledge accumulated in 28 years of experience in engineering and metallurgical research.

Thus Dow's pre-eminent position in the magnesium field makes it exceptionally well qualified to work with you in any development where the high strength-weight ratio of a metal is valuable.

DOWMETAL *magnesium*

THE METAL OF MOTION

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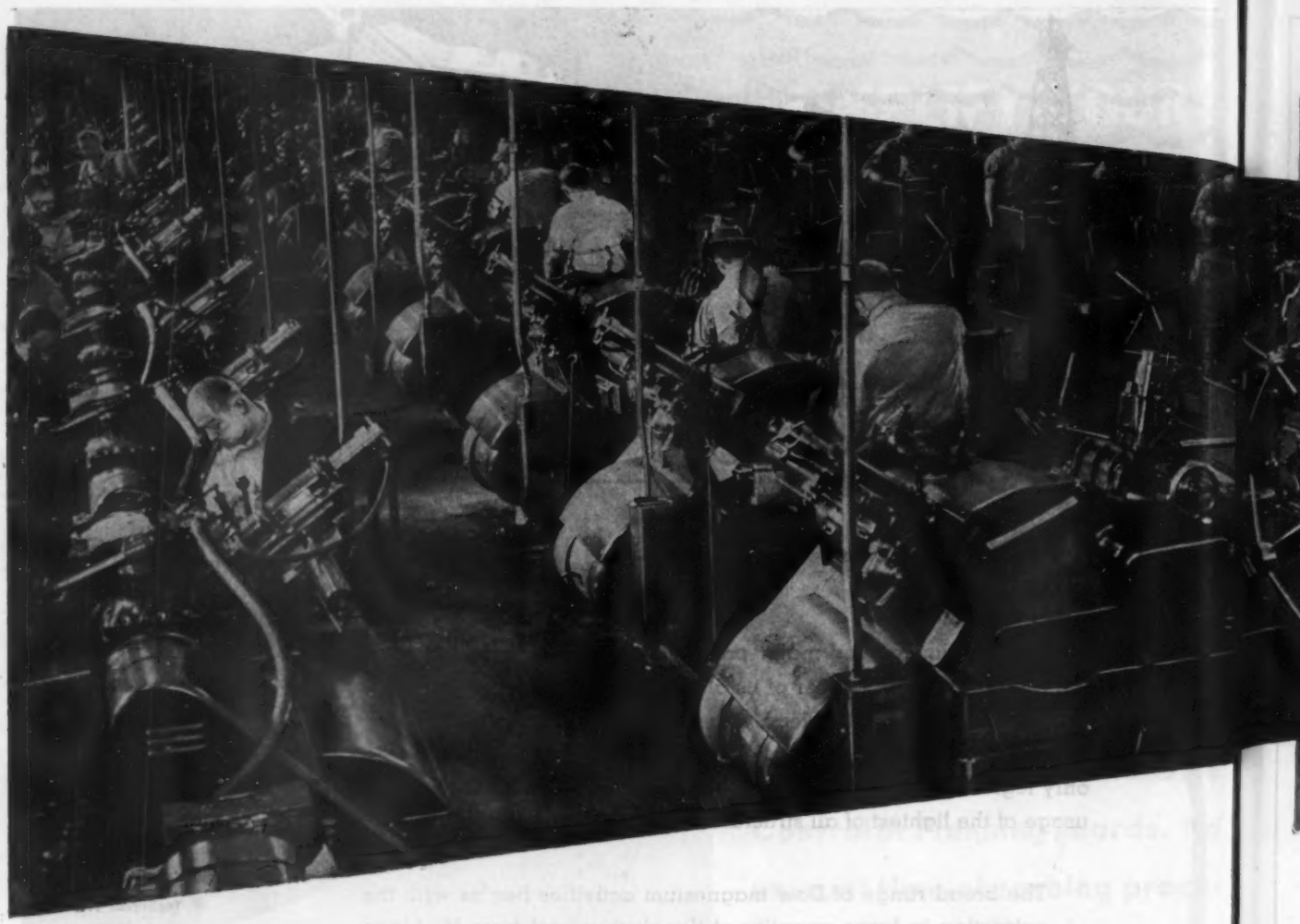


RECONVERSION RUSTPROOFING

Texaco Rustproofing Products Meet Ordnance Specifications for Application on Government-Owned Production Equipment.

TEXACO

TEXACO

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS

OFFICIAL INSTRUCTIONS FOR RECONVERSION RUSTPROOFING

are contained in Ordnance Specification P. S. 300-4. This deserves your most careful consideration.

ORDNANCE Instructions for processing, packaging, packing and marking of production equipment, as contained in Ordnance Specification P.S. 300-4, are extremely exacting.

To meet these specifications for processing machines, precision tools and other production equipment plant operators must use Government-approved rustproofing materials.

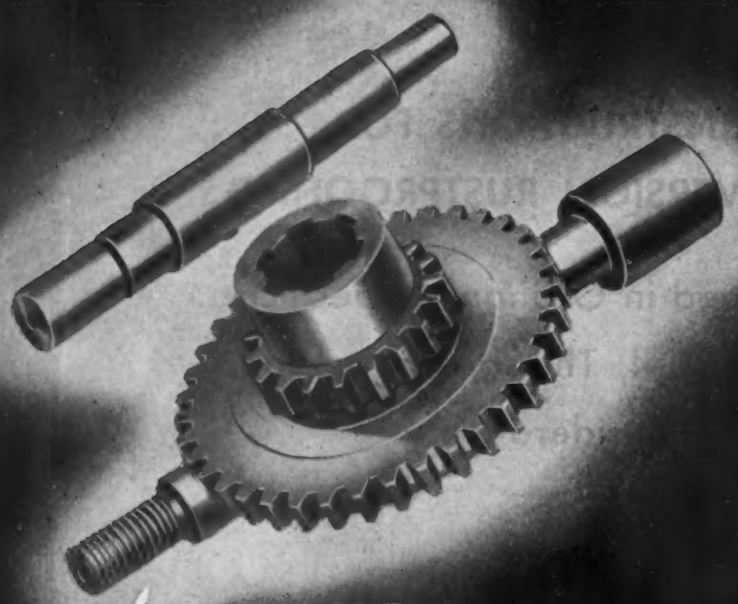
Texaco rustproofing materials meet Government specifications. They are easily applied through the medium of brush, dip or spray, and provide a protective coating that will assure the preservation of this materiel for years. No matter what your rustproofing requirements, get in touch with a Texaco representative through any one of more than 2300 Texaco distributing points in the 48 States, or write to The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Rustproofing Products

METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

COLD FINISHED .45+ CARBON OPEN HEARTH

SPEED TREAT STEEL



for FLAME *or*
INDUCTION HARDENING
with FAST MACHINING

USE SPEED TREAT STEEL

You will obtain hardness of 60 to 62 Rc. with water quench and of 56 to 58 Rc. with oil quench from flame or induction hardening of SPEED TREAT STEEL . . . and it machines consistently at 170 S.F.P.M.

Scores of users' plant records prove production increases of 35 to 55% — doubled tool life — elimination of breakage — scrap reductions of 50 to 75% — no warpage — and superior finishes.

SPEED TREAT ECONOMICALLY REPLACES C1043-C1046-C1137 and C1144. *USE SPEED TREAT STEEL!*

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WAR BONDS

Our Metallurgists Are At Your Service
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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

IMMEDIATE DELIVERY

No. 1 to 60
New High Speed
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DRILLS

No. by Gage	Length	Our Price Net Each
1 to 10	6¼	$ .75
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31 to 40	5¼	.75
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If you buy 60 drills or more — 20% discount

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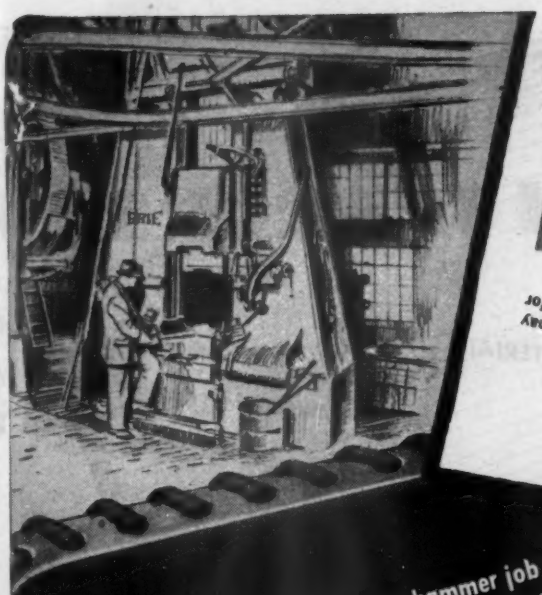


Test Your FORGING I. Q.

1 A part is made as a two-hammer job
(a) when it requires too many impressions
to get in one die. (b) to divide the work evenly
among the employees. (c) for economy in production.

2 A two-hammer job is run on adjacent hammers because
(a) it minimizes the loss of heat in transfer. (b) one man can
operate both hammers. (c) it results in the most production
with the least manpower.

3 When a board drop and a steam drop hammer are used
together on a job, the usual practice is (a) to use a steam
drop hammer for preliminary operations. (b) to use a steam
drop hammer for finishing impressions.

4 On a two-hammer job sometimes the forging is permit-
ted to cool between the first and second hammer because
(a) it is desirable for the man who does the preliminary oper-
ation to finish his own forging. (b) that is less expensive than
to slow up production where one hammer requires more time
than the other. (c) it is necessary to cool metal on some types
of forgings to permit inspection.

5 The largest board drop hammer built is an Erie rated at
(a) 10,000 lbs. (b) 9,000 lbs. (c) 15,000 lbs.

6 The range of weight of forgings that can be produced
commercially on board drop hammers is (a) 1 lb. to 20 lbs.
(b) less than 1 oz. to 100 lbs. (c) 1 lb. to 50 lbs.

7 What competition will the drop forging industry have
after the war?

ERIE FOUNDRY CO.
Erie, Pa., U.S.A.

1. (a) and (c).
2. (a).
3. (a).
4. (b) and (c).
5. (a).
6. (b).
7. You can answer this question by study of products which may be recommended to replace forgings and of new applications for forgings.

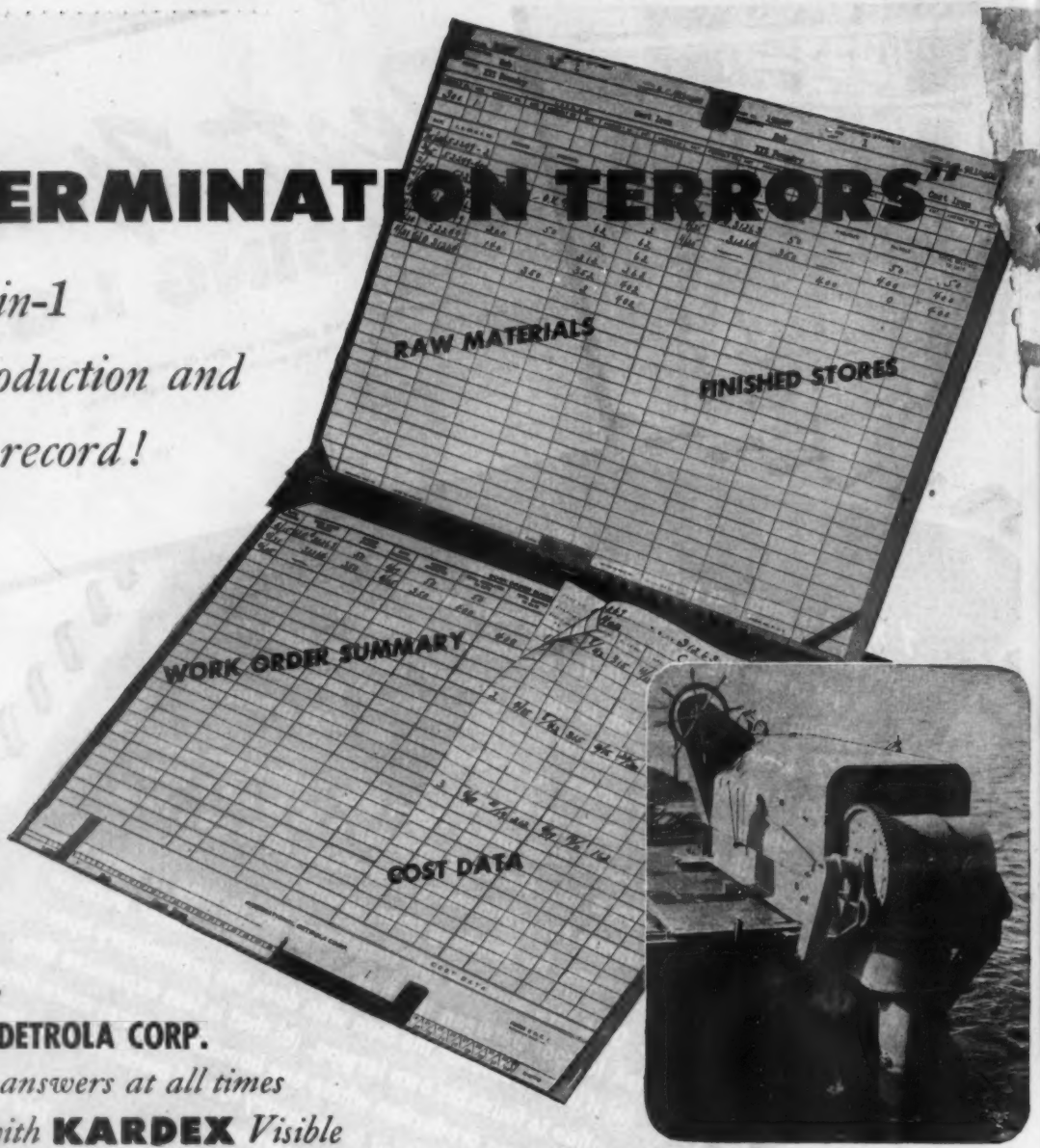
ARMY E NAVY

ERIE

ERIE BUILDS *Dependable* HAMMERS

NO "TERMINATION TERRORS"

with this 4-in-1 material production and cost control record!



Libby Division,
INTERNATIONAL DETROLA CORP.
has all the answers at all times with **KARDEX** *Visible*

The enviable war record of Libby Division of International Detrola Corporation includes not only a huge output of Libby heavy-duty turret lathes, but in addition large numbers of outboard propulsion units for landing craft.

Interest centers on the highly efficient form of production and cost control record used by this manufacturer for two reasons:

the degree and ease with which it facilitates operating efficiency, and the extent in which it provides data for use in Contract Termination.

Due to the flexibility of the Kardex Method of *Visible* Control, all pertinent records controlling raw materials from time of receipt, through processing, and into finished stock are housed together in a single system. Hence, only one reference is needed to obtain any information desired about any part or item. At a flip of the finger the Raw Materials Ledger, Finished Materials Ledger and Work Order Summary are all revealed, together with the work order tally cards which are sent to the Cost Department as each is completed.

The Kardex *Visible* Margin for each item does far more than speed up reference and posting operations —it charts *graphically* the current amount on hand of both raw materials and finished parts, and the stage of completion of raw material in process! With exclusive Graph-A-Matic signal control it provides a "moving picture" of operations—the basis for accurate coordination of activities with a minimum of time and labor.

FULL DETAILS of the most modern record systems as used by leading war producers are available from our nearest Branch Office. Write, wire or telephone today.

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SYSTEMS DIVISION

REMINGTON RAND

Buffalo 5, New York

Firm as Fixed Bayonets

4-WINGED DRIVER CAN'T TWIST OUT OF ENGINEERED TAPERED RECESS IN AMERICAN PHILLIPS SCREW HEAD

. . . that's why

AMERICAN PHILLIPS SCREWS

drive Faster . . . Straighter . . .

and Cost Less to Use

Like a bayonet fixed on a gun, an American Phillips Screw can't wobble, twist off, *or drive any way but straight*. For the engineered, tapered recess in the American Phillips screw-head *fixes* the 4-winged driver firmly in position . . . makes screw and driver an inseparable, straight-line driving unit until the screw is set up flush and tight.

This brings new ease and speed to production screw-driving . . . makes power drivers practical for any type of work . . . prevents accidents, scarred and rejected work, loss from split screw-heads. That's why over-all savings, in plant after plant, score American Phillips Screws at 50% or better, *over any other type of screw fastening.*

What's more, American Screw Company inspects *every* American Phillips Screw . . . for physical fitness of head, thread, and point . . . then checks shipments by automatic weigh-count to assure full value. Try American Phillips Screws on your own assemblies. You'll find they cost less because they help you produce much more.

AMERICAN SCREW COMPANY, PROVIDENCE 1, R. I.

Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

Put the Screws on the Japs . . . BUY BONDS!

Sta-Kool
DIAMOND DRESSERS
For Finish-Dressing
This improved, patented tool holder provides a fast and accurate means of truing and dressing grinding wheels. Equipped with internal coolant ducts for wet grinding, and external cooling fins for dry grinding, both metal setting and stone are kept at safe operating temperatures, eliminating diamond fracture due to overheating. Tool life is thus prolonged, effecting savings from 30 to 50 per cent in diamond dressing and truing costs.
For rough-dressing "Smitite" Cluster Diamond Tools are available, in which the stones may be completely consumed without resetting.
Catalog on request.
J. K. SMIT & SONS
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ALLOY STEELS FOR VICTORY

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

Wheelock, Lovejoy & Co., Inc.

138 Sidney Street
Cambridge 39, Mass.

Cleveland 14, Chicago 23, Newark 5, Detroit 3, Buffalo 10, Cincinnati 32

"HE SAYS HE CAN THANK PURDY FOR HIS PRESENT FLUID CONDITION"

Purdy can get *you* all set, too, for changes looming up. First thing we suggest is you stop right now on the stocking up of war steels. Depend on our inventory of over 6,000 items. Then when war contracts terminate, depend on us to get you set for civilian production. No matter whether your contract ends in a matter of weeks or a matter of months, you'll know that you won't get caught with heavy stocks you can't use.

And whether you've an emergency problem of supply or application or a long range planning question, consult our sales engineers. They have the complete PLANET line to back them up!

PLANET A. R. Purdy Co.
INCORPORATED
790 Greenwich St. • New York 14, N.Y.

COLD FINISHED STEELS • SPRING STEELS • TUBING
TOOL STEELS • DRILL ROD • SYMONDS GROUND STOCK

..through the use of

WYCKOFF

HEAT TREATED COLD FINISHED BARS

Pause for a moment and consider the sizable savings in time, money and equipment you could effect in your post-war products by the elimination of these costly operations—through the use of Wyckoff Heat Treated, Cold Finished Steel Bars. Tremendously successful in peacetimes, a "must" in World War II, Wyckoff metallurgical engineers will gladly demonstrate why Wyckoff Heat Treated, Cold Finished Bars are being specified on so many post-war blueprints.

WYCKOFF STEEL COMPANY

General Offices: PITTSBURGH 30, PENNA.

Works: AMBRIDGE, PENNA.; CHICAGO, ILL.; NEWARK, N. J.; PUTNAM, CONN.
Manufacturers of Carbon and Alloy Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2". ● Complete Annealing and Heat Treating Facilities.

KEEP EVERYTHING UNDER VEEDER-ROOT

"COUNTROL"

...and make your production COUNT FOR MORE

There's less chance for parts stocks to run out or overflow through oversight or error when Veeder-Root Devices count all units of machine-performance all along the line, through every operation. The *right number* of pieces or sub-assemblies can be finished at the *right time*... and that's what counts in war production.

Complete Veeder-Root "*Countrol*" is easy to install, for there is a type of Veeder-Root Device to record the performance of any machine or process... mechanically or electrical... in any terms or units like turns, strokes, pieces, trips, volumes, lengths. And these up-to-the-minute facts in figures, quickly noted on production control sheets, form the basis for tighter scheduling, closer departmental co-ordination, and *higher output*. Find out how Veeder-Root "*Countrol*" can make *your* production count for more than ever before. Write.

The Counting House of Industry

VEEDER-ROOT INCORPORATED

HARTFORD 2, CONNECTICUT *In Canada:* Veeder-Root of Canada, Ltd., Montreal *In England:* Veeder-Root Ltd.
(new address on request)

AUTO-LITE DIE CASTINGS

...Dependable Fighters for Freedom

Auto-Lite Die Castings are the choice of engineers for the most exacting requirements, for example, parts for automatic pilots and flight indicating instruments.

Long experience in the die casting art and in die design results in castings of uniform density capable of passing rigid X-ray inspection. As a result, Auto-Lite die castings are in great demand as parts for intricate mechanisms of aviation precision instruments.

Zinc and aluminum die casting, machining and finishing facilities are combined under one roof at the Auto-Lite Die Casting plant. Equipment of the most modern type is used.

Within the limits of today's wartime demands, Auto-Lite will be glad to put its wide experience at your service in adapting and producing die castings to meet your individual requirements.

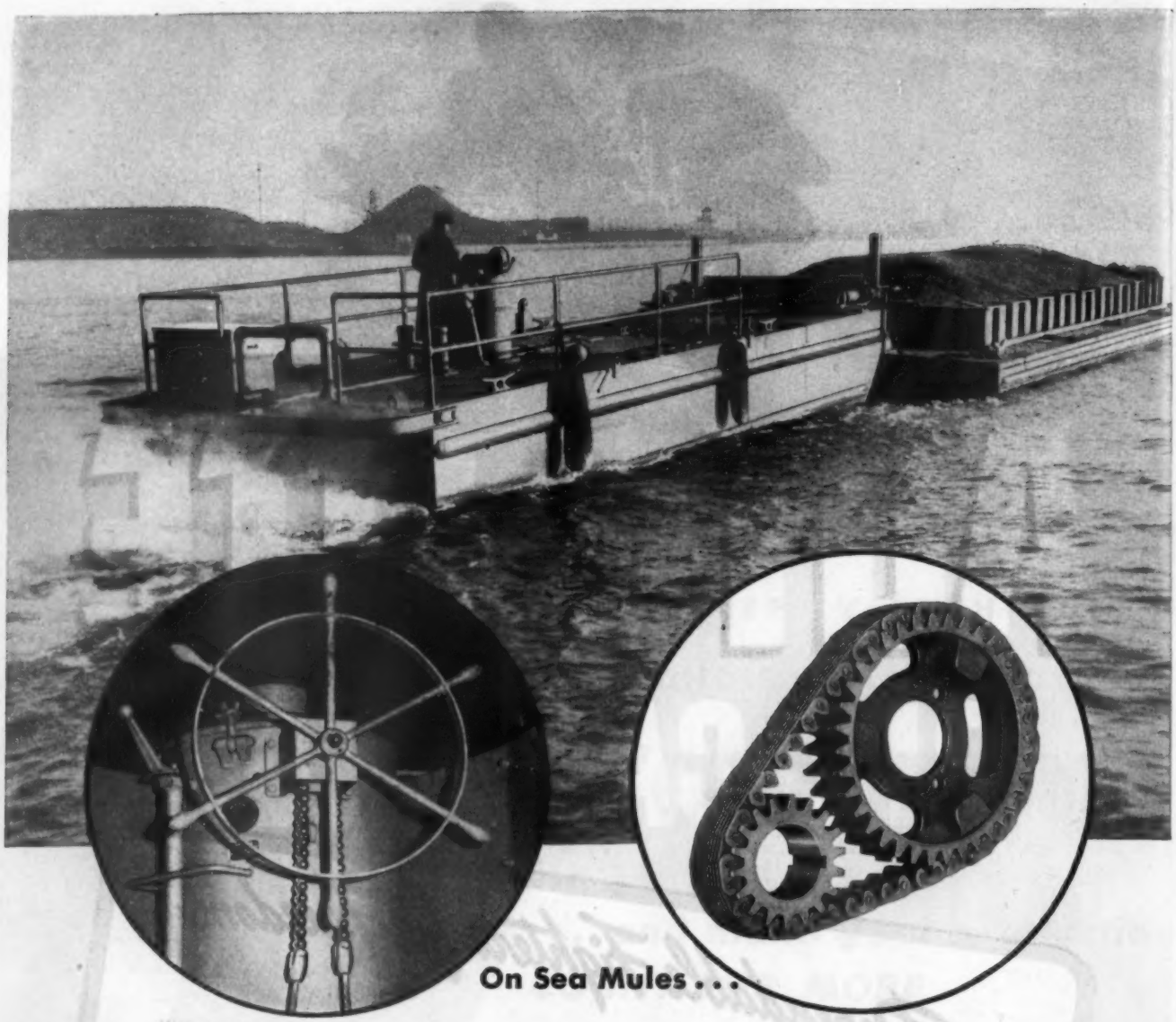
BUY WAR BONDS

THE ELECTRIC AUTO-LITE COMPANY
Die Casting Division
Woodstock, Illinois

600 South Michigan, Chicago, 5

723 New Center Building, Detroit, 2

Auto-Lite Die Castings facilitate mass production of this Directional Gyro Control unit of the Gyropilot.



On Sea Mules . . .

CHAIN means *POSITIVE CONTROL*

When invasion calls for dependable sea mule tractor and tug operation, there is no substitute for the positive power transmission and control which only chain can provide.

On the sea mule tractors and tugs Morse roller chain provides sure steering wheel control, and Morse silent automotive timing chains on the engines help maintain smooth, trouble-free operation under severe conditions.

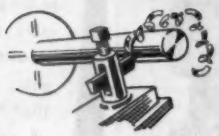
When you have a problem of power transmission or control, take advantage of the Morse engineer's background of a half century's experience. He invites your consultation.

SPROCKETS · CHAINS · FLEXIBLE COUPLINGS · CLUTCHES

MORSE *Roller and Silent* CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

when you need all 3 –



1. MACHINABILITY—With an ease of machining close to that of free-cutting brass, this new alloy eliminates the bottleneck of producing parts from tough machining copper.

2. FORGEABILITY—Hot forges readily—tellurium has no adverse effect upon the hot working properties of copper—an important advantage over leaded copper. May also be extensively cold worked.

3. CONDUCTIVITY—High electrical conductivity (averages 90% of pure copper's). In this respect Tellurium Copper far surpasses any of the free cutting brasses. Excellent thermal conductivity, too.

IT'S A JOB FOR

CHASE TELLURIUM COPPER

Naturally, an alloy that combines all these features has found many uses in the aeronautical industry (for the manufacture of small contact pins or inserts in multiple contact assemblies)...in Electrical, Radio, Communications and similar applications, as well as in the welding and cutting torch tip field.

Full information on this unusual alloy, developed and patented by Chase Brass & Copper Co. is, of course, available on request.

CHASE BRASS & COPPER CO.

—Incorporated—
Waterbury, Connecticut
SUBSIDIARY OF KENNECOTT COPPER CORPORATION

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BALTIMORE
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ST. LOUIS
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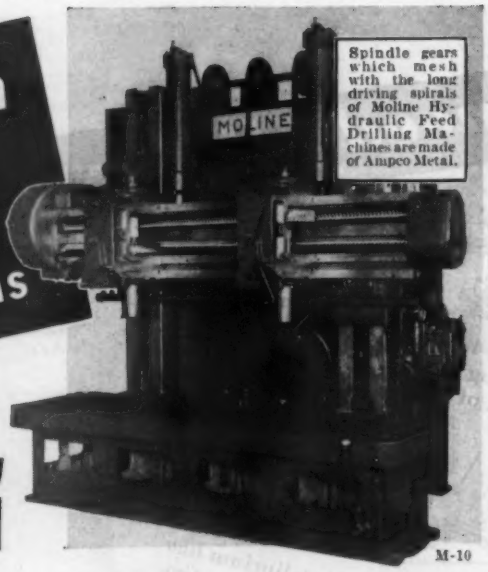
† *Indicates Sales Office Only*

This is the Chase Network—handiest way to buy brass

Protection against costly breakdowns



Spindle gears which mesh with the long driving spirals of Moline Hydraulic Feed Drilling Machines are made of Ampco Metal.

M-10

. . . provided by parts of wear-resisting

Ampco Metal

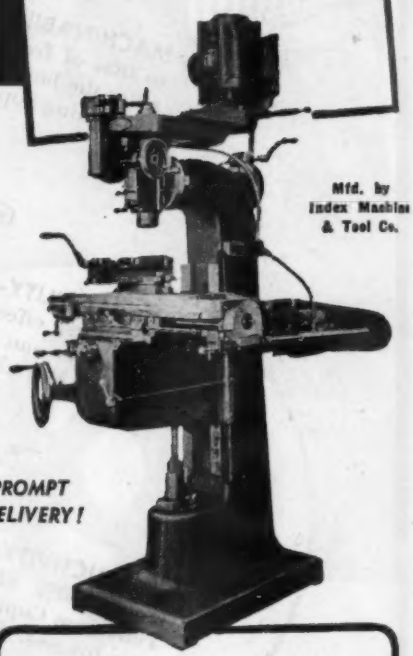
Protection of highly-stressed parts against wear, impact, fatigue is an important point to check in the specifications of machines you buy. Over 90 leading machine tool makers — like the Moline Tool Company, Moline, Illinois — guard against costly failures with parts of Ampco Metal. This remarkable aluminum bronze alloy has controlled physical properties that give it several times the life of ordinary bronzes. Be sure you get it in your new machines. And insist that replacement parts for your older machines be made of durable Ampco. Write today for File 41 of Engineering Data Sheets.

AMPCO METAL
The Metal without an Equal

Ampco Metal, Inc., Dept. AM-12, Milwaukee 4, Wis.

INDEX VERTICAL MILLS FOR THE TOOL ROOM OR PRODUCTION LINE

Milling, Drilling or Boring. Verniers or Rods and Indicators for locating. Ask the shop that has one. Better still, ask the shop that has an Index and also another of competitive make.



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE. JACKSON, MICH.

99% Say "THESE ARE *THE* NUTS!"

"These nuts will be like a gift from heaven!" said a Kansas fleet owner in a recent survey.*

Ninety-nine out of every hundred replying said "YES!", when asked if Boots All-Metal Self-Locking Nut would improve post-war equipment.

More than 1000 fleet operators answered this survey. They named 60 spots where loose nuts cause breakdowns.

On these spots, the Boots Nut was tested on many trucks. Eighteen months of hard driving couldn't shake this one-piece nut loose from any connection! The Boots grip is unaffected by heat, gasoline, chemicals. Easily removed with a wrench. Can be used again and again.

BOOTS

SELF-LOCKING NUTS

"There's No Excuse for a Nut Shaking Loose"

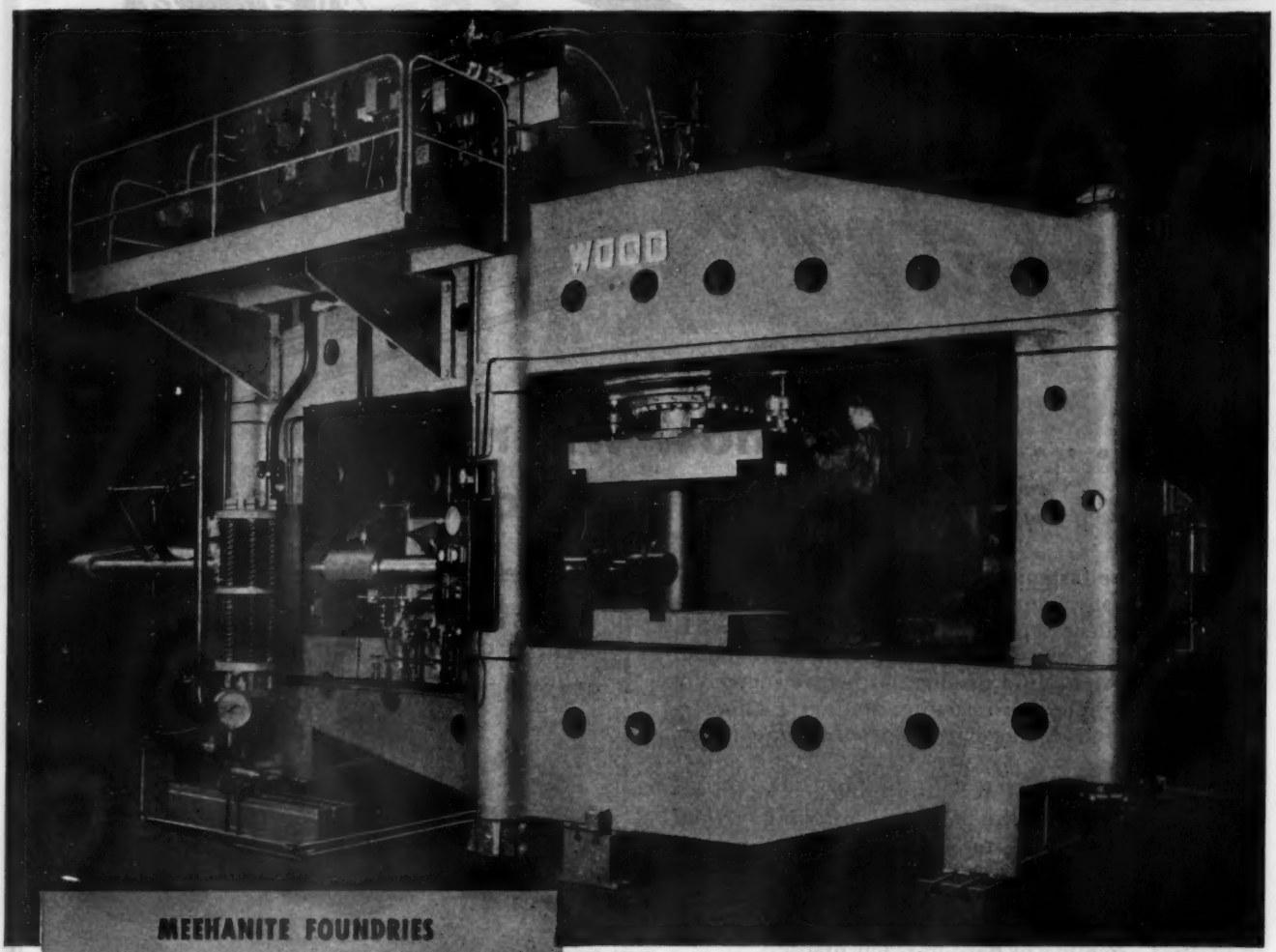
Boots Aircraft Nut Corp. • General Offices, New Canaan, Conn. Dept. A-10

*Operators of 110,000 motor vehicles indicated in this survey that if a vibration-proof nut like the above were standard on their post-war equipment, tens of thousands of dollars for maintenance and repairs would be saved.

Motion Picture—"All Work And No Play"—16 mm. sound—30 minutes. Write for information

Representatives in New York, Chicago, Detroit, Indianapolis, Los Angeles, Kansas City, Dallas, Toronto, Montreal, Vancouver

VITAL PARTS ARE MEEHANITE CASTINGS



20,575 lb. of Meehanite Castings are used in construction of this upsetting press.

. . . IN THIS CUSTOM-BUILT PRESS

At the Pittsburgh Steel Company's addition to its Allenport, Pa., plant for the production of tubular railway axles, the manufacturing process depends mainly upon this large tube upsetting press built by the R. D. Wood Company, Philadelphia, Pa.

As is the case in so many new designs for special equipment, important parts are Meehanite Castings. In this custom-built press the following Meehanite Castings were used:

Quantity	Part	Finished Weight
1	Horizontal Ram	11,500 lb.
2	Pistons	55 lb. each
2	Pull Back Covers	35 lb. each
1	Vertical Ram	7,400 lb.
2	Rollers	115 lb. each
2	Rails	270 lb. each
1	Stripper Ram	725 lb. each

These castings contribute the required high strength, resistance to wear and structural soundness essential to this equipment.

MEEHANITE QUALITY CONTROL ASSURES UNIFORM DEPENDABILITY

MEEHANITE RESEARCH INSTITUTE
NEW ROCHELLE, N. Y.

MEEHANITE FOUNDRIES
Ready to Serve You—NOW

Allentown, Pa.	Traylor Engineering Company
Ansonia, Conn.	Farrel-Birmingham Co., Inc.
Birmingham, Ala.	The Continental Gin Co.
Bridgewater, Mass.	The Henry Perkins Co.
Brooklyn, New York	E. W. Bliss Company
Buffalo, N. Y.	Pohlman Foundry Co., Inc.
Charleston, W. Va.	Kanawha Manufacturing Co.
Chattanooga, Tenn.	Ross-Meehan Foundries
Chicago, Ill.	Greenlee Foundry Company
Cincinnati, Ohio	Cincinnati Grinders Incorporated
Cincinnati, Ohio	The Cincinnati Milling Machine Co.
Cleveland, Ohio	Fulton Foundry & Machine Co.
Denver, Colo.	The Stearns-Roger Mfg. Co.
Detroit, Mich.	Atlas Foundry Co.
Flint, Mich.	General Foundry & Mfg. Co.
Hamilton, Ohio	The Hamilton Foundry & Machine Co.
Hamilton, Ontario	Otis-Fensom Elevator Co., Ltd.
Irvington, N. J.	Barnett Foundry & Machine Co.
Jeannette, Pa.	Elliott Company
Los Angeles, Calif.	Kinney Iron Works
Milwaukee, Wis.	Keuhring Company
Mt. Vernon, O., Grove City, Pa.	Cooper-Bessemer Corporation
New York, N. Y., Mahwah, N. J.	The American Brake Shoe Co.
Oakland, Calif.	Vulcan Foundry Company
Orillia, Ontario	D. Long, Ltd.
Philadelphia, Pa.	H. W. Butterworth & Sons Co.
Philadelphia, Pa.	Florence Pipe Foundry & Machine Co. (R. D. Wood Company, Selling Agents)
Phillipsburg, N. J.	Warren Foundry & Pipe Corp.
Pittsburgh, Pa.	Rossdale Foundry & Machine Co.
Portland, Oregon	Crawford & Doherty Foundry Co.
Rochester, N. Y.	American Laundry Machinery Co.
St. Louis, Mo.	Sumner Iron Works
St. Paul, Minn.	Valley Iron Works
Seattle, Washington	Washington Iron Works
Spokane, Washington	Washington Machinery & Supply Co.

Don't lay that pencil down

. . . till you show where the Short Cut Fastening Method can be used!

Choosing the fastening device for use in the assembly of your post-war product is a very important decision. It should be settled now, while the product is still in the design stage. Too many products are tooled up and ready to go into production before somebody starts to really question fastening methods. This frequently leads to needless expense, troublesome delays, and costly changes.

You will want to use P-K Self-tapping Screws wherever possible, because this *short cut fastening method* can save you from 30% to 50% in asembly time and labor! It is the *simplest* way to make most asemblies. You eliminate tapping for machine screws, and tap expense – fumbling with bolts and nuts – costly inserts in plastics – riveting in hard-to-reach places.

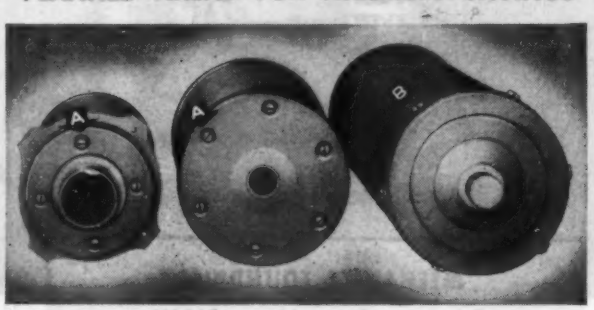
Whether you are working with light or heavy steel, cast iron, aluminum, brass, plastics – you'll find you can use P-K Screws to advantage in 7 out of 10 cases.

A P-K Asembly Engineer will help you plan ahead for savings, and you'll find his advice unbiased. He'll recommend only the best Self-tapping Screw for the job, because Parker-Kalon makes *all* types. Write and tell us when you would like him to call, or send details of your fastening jobs for recomendations.

HELPFUL GUIDE FREE!

The P-K "User's Guide" is crammed full of information on where and how to use P-K Self-tapping Screws, arranged so you can find the facts you need quickly. Write for it. Parker-Kalon Corp., 208 Varick St., New York 14.

HERE'S HOW PUROLATOR PRODUCTS, INC. PLANNED AHEAD FOR ASSEMBLY SAVINGS



(A) 4 Type "Z" Screws fasten sheet metal cap to steel (or aluminum) frame.

(B) 6 Type "Z" P-K Screws fasten the cast iron cap to steel tubing wall.

A Purolator executive says, "We designed most of our filters with P-K Screws in mind . . . to eliminate tapping.

"At least 4 P-K Screws are used in each Purolator unit. If we had to tap holes (800,000 per year) for machine screws, it would require ten times our present labor force, or lower production by the same ratio."

Purolator Products, Inc., make a wide variety of filters for gasoline, oil, air, etc., which are standard equipment on many vehicles, vessels, and airplanes.

PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS

SELF-TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY

CENTURY Splash Proof MOTORS

Provide *Two-Way Protection* For Machine Tool Applications

1. The Century splash proof motor frame protects the windings, bearings, and other operating parts from splashing liquids or falling solids. The unique Century design gives protection against foreign matter entering the motor, yet allows adequate ventilation.

2. The unusual freedom from vibration contributes to the accuracy of the driven machine, thus protecting the precision operation built into the machine.

There's a wide range of Century motors in varying types and sizes for nearly every application. A Century engineer will gladly help you select the right Century motor to meet your requirements.

Century C MOTORS

391

CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Why is this alloy called

Because MAGNOLIA ANTI-FRICTION is the most widely used of all babbitt metals for replacing worn bearing linings.

First placed "on the market" in 1886, MAGNOLIA ANTI-FRICTION METAL is a graphite-treated, self-lubricating alloy having the lowest coefficient of friction of any known bearing alloy — 300% lower than genuine babbitt. Service records prove its ability to absorb grit and dust and still provide an excellent bearing surface.

If you are not already familiar with MAGNOLIA ANTI-FRICTION METAL why not try it out? You can obtain a supply from your distributor . . . no priority required.

MAGNOLIA METAL CO.
18 West Jersey Street
Elizabeth 4, N. J.

•

MAGNOLIA METAL CO. OF CANADA, LTD.
2028 Manufacturers Street
Point Ste. Charles, Montreal

MAGNOLIA BEARING METALS

STREAMLINED ACTION!

MODEL 11020-A

The newer models in Gusher pumps, like that shown are perfectly adapted to the latest type machine-tools.

Streamline *your* machines with new-model

GUSHER COOLANT PUMPS

Notable for simplicity of design, minimum maintenance, range of flow (from a mere dribble to maximum capacity, with no leakage), adaptability to any type machine, capacity for hard usage, and moderate cost.

There is a Gusher model and type for your special needs. Write for new catalog, indexed for ready reference.

THE RUTHMAN MACHINERY CO.
READING ROAD CINCINNATI 2, OHIO
The "Gusher"—A Modern Pump for Modern Machine Tools

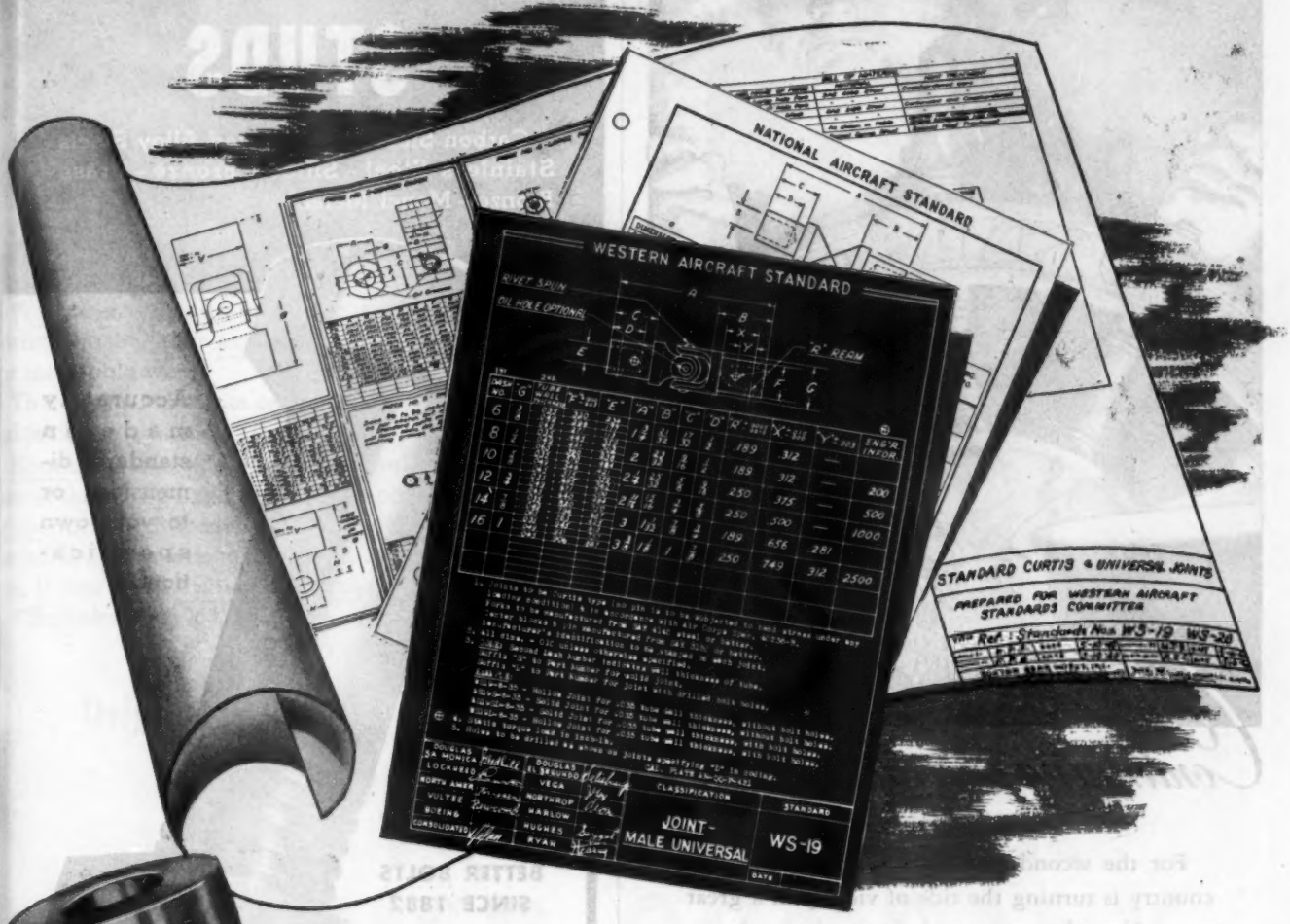
ROLL ON ABBOTT *Bearing* BALLS

their stamina assures
UNINTERRUPTED PERFORMANCE
Specify "ABBOTT"

THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.

In the Air *or on the Ground...*

CURTIS SETS THE STANDARD



"STANDARDS" for the innumerable parts that make up a complete machine tool must be as rigid as those used in plane manufacture.

Curtis Universal Joints, made to Curtis "Standards," which have been adopted by "Aircraft Standards Committees," give manufacturers a high quality joint — a joint that meets and surpasses Army Air Corps Class 1 specifications.

Hundreds of machine tool builders have found that these joints, either single or double in any of 14 sizes, stand up under continuous operation of such equipment. Joints must be tough. Special steel alloys developed through years of Curtis production experience — careful hardening to increase toughness — accurate machining to close tolerances give smooth, hard wearing surfaces.

The patented Curtis "Telltale" lock ring tells you at a glance that a joint is firmly locked together — permits rapid disassembly and reassembly for inspection or repair. No screws or nuts to come loose as a result of thread-wear or vibration. Curtis "Oilers" assure proper and vital lubrication.

For any and all jobs where long life and continued heavy duty are essential, choose Curtis "Standards" for your "Standards." Curtis Engineers are at your disposal to help you solve your universal joint problems.

CURTIS UNIVERSAL JOINT CO. INC.

SPRINGFIELD, MASS. • BOSTON GEAR WORKS, NO. QUINCY, MASS., SOLE DISTRIBUTORS

Continuing on with Confidence

For the second time in one generation this country is turning the tide of victory in a great war. Abroad, our armed forces have shown what free men can accomplish. At home, free enterprise has proved itself by the tremendous volume of its production.

Acme Aluminum Alloys, Inc., is itself a product of free enterprise. Little known in 1919, it is now among the leaders of its industry. The growth of companies like Acme is proof that the free enterprise system remains vigorous and strong.

Free men and free enterprise are steering this country through a great crisis. Free men and free enterprise can continue on with confidence, whatever the future may bring.

ACME *Aluminum Alloys, Inc.*
Formerly Acme Pattern & Tool Co., Inc.
DAYTON 3, OHIO
PATTERNS • TOOLS • ALUMINUM CASTINGS • ENGINEERING

USE HEADED AND THREADED FASTENERS FOR ECONOMY AND RELIABILITY

BOLTS · NUTS STUDS

Carbon Steel – Heat-treated Alloy Steels – Stainless Steel – Silicon Bronze – Brass – Bronze – Monel Metal.

Accurately made in standard dimensions or to your own specifications.

BETTER BOLTS SINCE 1882

PAWTUCKET

"THE BOLT MAN"

MANUFACTURING COMPANY
327 Pine Street • Pawtucket, R. I.
THE PLACE TO SOLVE YOUR BOLT PROBLEMS

For Bolted Security

LOOK HERE

Nuts do not budge on bolts while there is even the slightest pressure on their threads—but all other parts of bolted assemblies will loosen sooner or later unless a strong spring washer holds all the other parts tight.

The parts below the nut loosen because of bolt stretch, and frictional wear of metal on metal, burrs and flares; pulverizing paint, rust and scale.

For lasting security you must use a powerful spring washer that expands and compensates for inevitable wear.

There is no substitute on any assembly that is subjected to vibration.

No nut whether it's a regular standard nut or one of the many fixed or lock-nuts can keep the other parts from loosening. So specify National Kantlink spring washers with all or any type of nut, if you want lasting bolted security.

Kantlinks can't lose a test. Write for booklets.

National Kantlinks conform to Government Specifications BECX 1-2-3, AN 935, and drawing 12-Z-22.

Originators of KANTLINK the long-range spring washer

NATIONAL LOCK WASHER COMPANY

NEWARK, N. J., U. S. A.

Let a simple retaining ring save metal and money for you

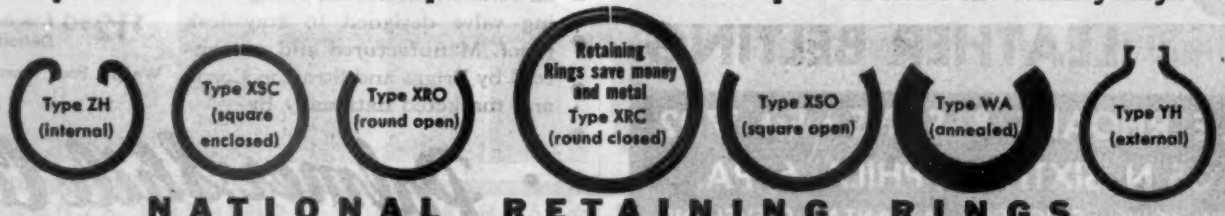
Every shoulder on your machines or on your metal products should be examined to see whether or not smart engineering could take advantage of these modern artificial shoulders on shafts or in housings.

It is needless waste in most instances to turn your shoulders by cutting down larger shafts, when you can groove a smaller shaft and apply a spring steel retaining ring. You'll get better results at great savings.

It's expensive to hold a mechanism in place with unnecessarily big shoulders or collars—or to temporize with small cotter pins, etc. Let us show you how spring steel retaining rings can do a thoroughly efficient job for you.

More and more retaining rings are being used in these days of necessary economy. Every ounce of metal and every cent of cost is more important today than ever before.

Write today for our folder on Retaining Rings.



NATIONAL RETAINING RINGS

Rhoads Engineering Service

Can Show You the Way to Get Lower Belt Costs, Maximum Machine Output

Rhoads Engineering Service, based on many years of leather belting manufacture and application, has helped many others secure economies through greater drive efficiency combined with longer belt life and lower maintenance time and trouble.

Rhoads Tannate Leather Belting is unusually strong with a firm pulley grip that assures maximum machine output, even when the load varies. It is resistant to moisture, machine oils and many weak chemicals.

Little maintenance is needed except occasional applications of Rhoads Tannate Belt Preserver. *For more details write us.*

Rhoads *Tannate* WATERSHED LEATHER BELTING

J. E. RHOADS & SONS • Est. 1702
35 N. SIXTH ST., PHILA. 6, PA.
NEW YORK · CHICAGO · ATLANTA · CLEVELAND

Felt

DOING SERVICE IN *Countless* WAYS!

Because of felt's extreme versatility, it is used in an enormous number and variety of products as channels, pads, gaskets, wicking, weatherstripping, thermacoustic insulation, etc.

Processed by Western Felt Works in grades ranging from wool softness to rock hardness, and in practically any shape and size, felt is useful wherever the job requires resistance to heat, age, water, oils; resiliency, flexibility, compressibility, or many other properties.

Western Felt Works engineers will assist you in determining possible uses for felt in your products. *Write us today.*

Acadia Synthetic Division, Western Felt Works. Processors Synthetic Rubber, Sheets, Extrusions, Molded Parts.

WESTERN FELT WORKS, 4035-4117 Ogden Ave., Chicago 23, Ill.
Branch Offices in All Principal Cities

WESTERN *Felt*
Largest Independent Manufacturers and Cutters of Wool, Hair and Jute Felts

AIR-SAVER *Leak Proof* AIR VALVE

- Use wherever a controlled blast of air is needed for cleaning, drying, cooling or ejecting. Easy to install.
- Mount in any position. Operates at any angle. Provides extra large air volume. Clean seal, a long wearing valve designed to stay leak proof. Manufactured and guaranteed by Briggs and Stratton Corp., and marketed nationally by

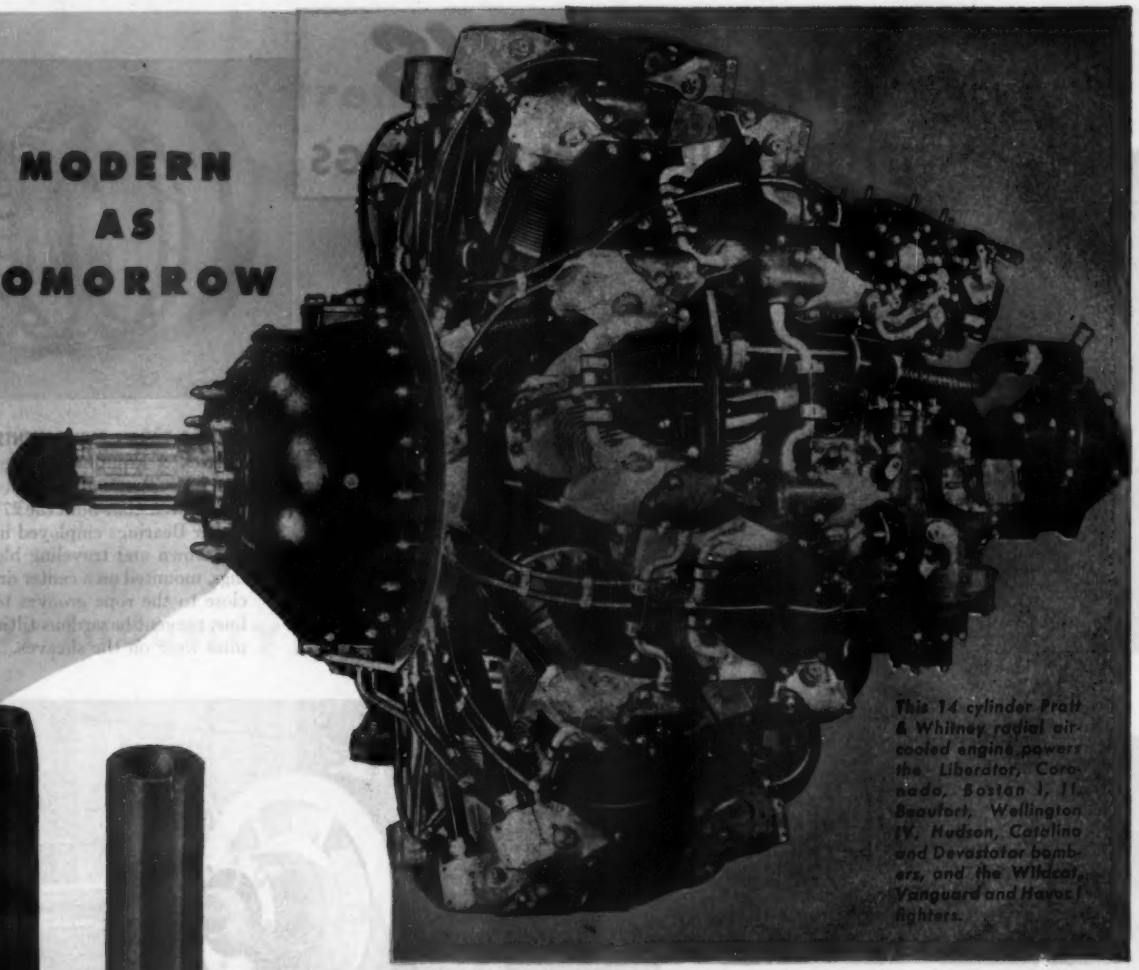
Valve, mounting rods and operating cam, complete as shown.

$12.50 *f. o. b. Detroit*

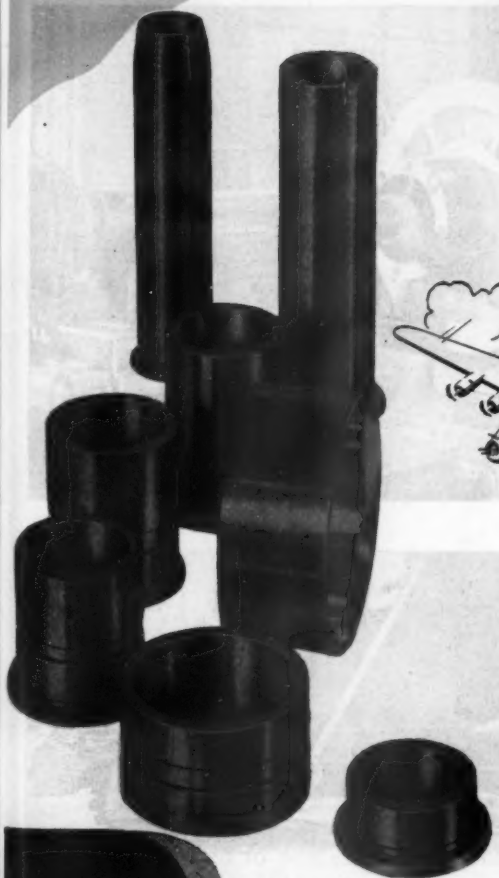
Weight Four Pounds.

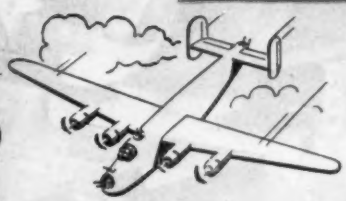
Palmer-Shile Co.
780 So. Herrington St., DETROIT 17, MICHIGAN

MODERN AS TOMORROW



This 14 cylinder Pratt & Whitney radial air-cooled engine powers the Liberator, Coronado, Boston I, II, Beaufort, Wellington IV, Hudson, Catalina and Devastator bombers, and the Wildcat, Vanguard and Havoc I fighters.





● In this engine, modern as tomorrow, a product of finest engineering and manufacture, there are sound reasons why sleeve bearings predominate.

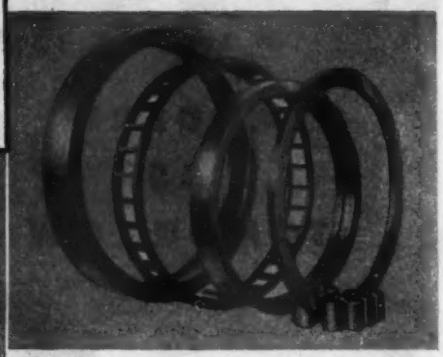
Bunting Cast Bronze Bearings play an important part in this engine, as in many other machines of war. In the coming machines of peace, Bunting will play an equally important role.

Bunting Bronze Bearings, standard or special, and Factory Finished Tubular and Solid Bronze Bars promptly available. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Warehouses in Principal Cities.

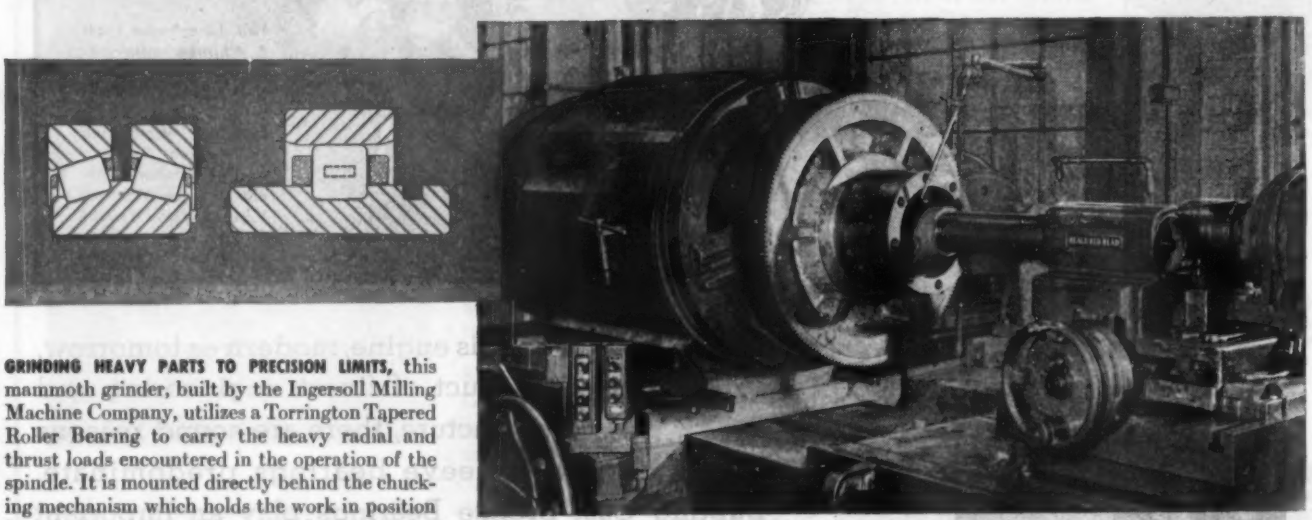
Bunting

BRONZE BUSHINGS ☆ BEARINGS ☆ PRECISION BRONZE BARS

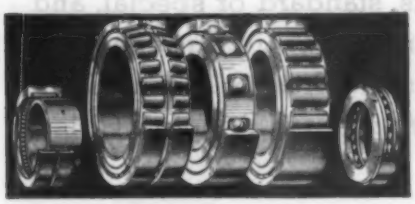
IN THE NEWS
WITH TORRINGTON BEARINGS



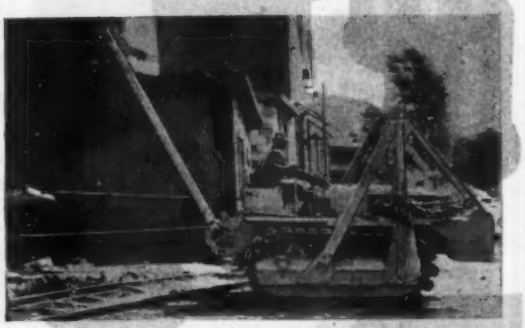
MEETING DESIGN REQUIREMENTS of the Emsco Derrick & Equipment Company, the engineers of Torrington's Bantam Bearings Division custom-built the 27½" O.D. Radial Roller Bearings employed in the sheaves of the crown and traveling blocks. The bearings, mounted on a center drum, are located close to the rope grooves to conserve wire line, prevent hazardous tilting, and to minimize wear on the sheaves.



GRINDING HEAVY PARTS TO PRECISION LIMITS, this mammoth grinder, built by the Ingersoll Milling Machine Company, utilizes a Torrington Tapered Roller Bearing to carry the heavy radial and thrust loads encountered in the operation of the spindle. It is mounted directly behind the chucking mechanism which holds the work in position for grinding. A tapered bore radial roller bearing is mounted on the back end of the spindle, where a "V" belt pulley connects direct to the motor drive. After four years in operation the eccentricity and face run-out of these bearings is .00025.



DESIGNERS of this Williamette Hyster towing winch, installed on a Caterpillar tractor, specified heavy-duty Torrington Needle Bearings for use in the idler and reverse gears. The Williamette Hyster Company says, "Because of the restricted space in the comparatively small gears, needle bearings are the only practical type of anti-friction bearings that can be used."



EVERY MAJOR TYPE OF ANTI-FRICTION BEARINGS is included in the Torrington line—straight roller, tapered roller, needle and ball. In addition to supplying every branch of industry with a wide range of standard bearings, the engineering staff of Torrington's Bantam Bearings Division designs bearings in large sizes and of special types for new or unusual applications. For experienced counsel in meeting today's requirements—or assistance in postwar plans TURN TO TORRINGTON.

ARMY E NAVY

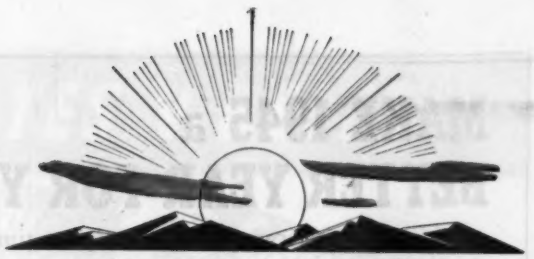
TORRINGTON BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

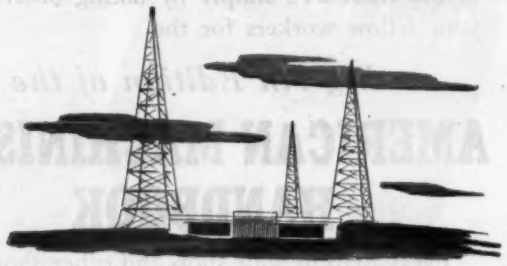
THE TORRINGTON COMPANY • BANTAM BEARINGS DIVISION

SOUTH BEND 21, INDIANA

A Great Electronic Day...

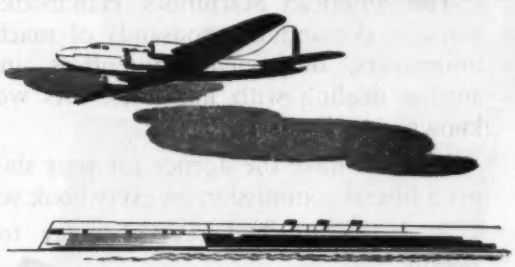


for Communications

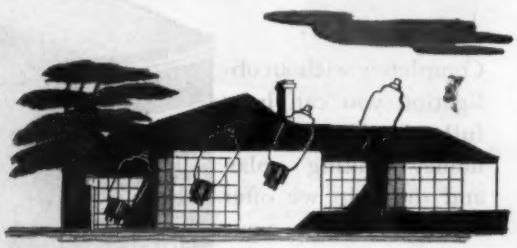


for Industry

for Transportation



for Home



Raytheon is proud of its contributions in the development of new electronic tubes and complete electronic equipment for the Armed Forces. Proud of the trust the military has placed in our designs, engineering and manufacturing abilities.

When war ends, Raytheon's wartime experience, research facilities, engineering and the production skills of over 16,000 men and women will be turned to peacetime electronics. Then you'll hear about and see Raytheon Electronic Equipment that will provide untold benefits in all phases of electronics. In the coming Age of Electronics . . . LOOK to Raytheon for complete electronic equipment and electronic tubes.

Tune in the Raytheon radio program: "MEET YOUR NAVY," every Saturday night on the entire Blue Network. Consult your local newspaper for time and station.

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MANUFACTURING COMPANY
Newton and Waltham, Massachusetts

Devoted to research and manufacture of complete electronic equipment; receiving, transmitting and hearing aid tubes; transformers; and voltage stabilizers.

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This year you can make your spare time pay CASH RESULTS simply by taking orders from your fellow workers for the

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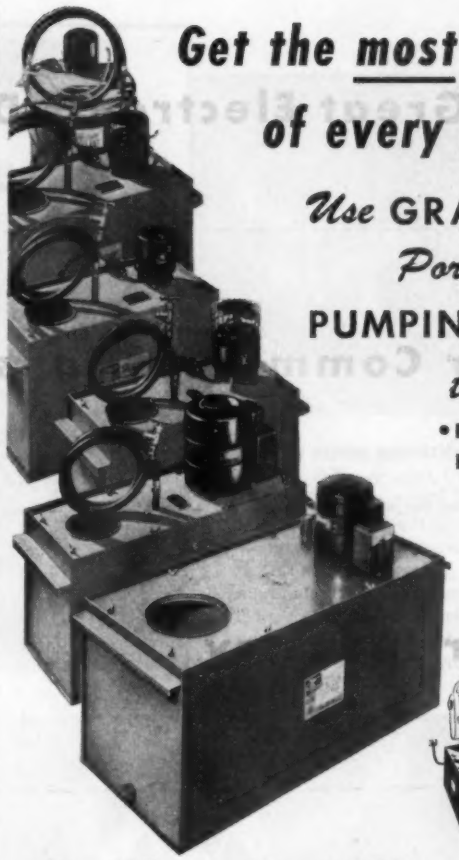
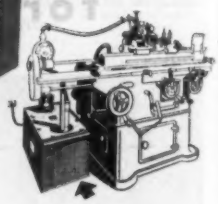


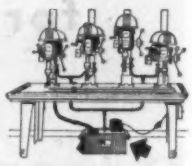
Get the most out of every machine

Use GRAY-MILLS *Portable* PUMPING UNITS *to*

- INCREASE PRODUCTION
- PROLONG TOOL LIFE
- IMPROVE FINISH



On a Grinder



On a Drill Press

On a Punch Press

• Gray-Mills complete, portable Pumping Units are suitable for many different jobs. They apply —in controlled volume, intermittently or constantly—coolants, lubricants, quenching and hydraulic oils, chemicals and other fluids.

Widely used as coolant systems on lathes, grinders, drill presses and other machine tools, they step up production, prolong tool life and improve finish. By their dependable performance, they quickly pay for themselves in lowest production costs.

Gray-Mills Units are used also for automatic application of lubricants to punch press dies, and to provide a compact oil circulating system for machine lubrication.

There is a Gray-Mills Unit for most every production requirement.

Centrifugal Models—3600 to 2200 GPH—5' head.

Gear Models—60 to 180 GPH—10 to 50 PSI.

Send for the G-M condensed catalog—gives complete details and prices.

GRAY-MILLS CO., 1953 Ridge Ave., Evanston, Ill.

PROMPT DELIVERY

Complete Portable

PUMPING UNITS

FRACTIONAL H. P. PUMPS
INDUSTRIAL FLUID REFRIGERATING SYSTEMS
PARTS CLEANING SYSTEMS

Here are 5 TYPES of GATES V-BELTS

ONE of these five types Will Fit Any Need You Have!

Whenever a drive in your plant is wearing out belts faster than it should—or is giving any other trouble—just *pick up your phone* and call the Gates Rubber Engineer.

He can quickly analyze your problem and, in most cases, he can correct the trouble very easily without needing to specify the use of any special-structure belts.

There *are* service conditions, however, under which a V-Belt of special construction can most profitably be used—and your Gates Rubber Engineer can then supply a Gates V-Belt that is precisely engineered to meet the unusual conditions.

The Gates V-Belt of special synthetic rubber is a notable example. As a result of specialized research, Gates developed this synthetic rubber V-Belt and began supplying it in large quantities to industry more than six years ago. Under severe conditions of heat and oil, this Gates special synthetic V-Belt actually outwears any natural rubber belt by as much as 230%.

In your particular application, V-Belts with tension members composed of flexible steel cables —or of rayon cords—may prove to be the most efficient and economical. Again, Gates Static-Safety V-Belts may best fit yur special need.

In any case, the wisest move you can make is to phone the Gates Rubber Engineer. (Just look under "Gates Rubber" in your phone book.) He will come right to your plant—will thoroughly analyze any drive problem you may have—and he will always recommend the practice that will be most efficient and economical for you.

4412

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

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NEW YORK CITY 3, 215-219 Fourth Avenue
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OUT OUR WAY BY J. R. WILLIAMS
WHY, I NEVER THOUGHT A TOUGH OL' BIRD LIKE TH' BULL O' TH' WOODS WOULD EVER FAINT-- TH' HEAT, MAYBE!
NO, THIS IS TH' FIRST TIME HE'S SEEN WHAT HE CONTROLS WITH PUSH BUTTONS -- WHEN LESS THAN A YEAR AGO THEM LITTLE BLACK BUILDIN'S IN TH' MIDDLE GIVE HIM ALL HE COULD DO!
THE BURIED PAST
J.R.WILLIAMS

A Bird's Eye View Floors the Old Bull...

The "Old Bulls" of the country have all been too busy doing their job—to step back and see how big a job they've done.

Nothing floors 'em quicker than a bird's eye view of the whole show. And what a show it has been! Perhaps the greatest of their achievements has been their precision miracles on a low-cost, mass-production scale.

As a result, when peace comes the Old Bulls running American industry will bring to more people than ever the finer conveniences, comforts, even luxuries that were once too costly. All of which means more jobs post-war for our fighting men and all at home.

(*Below*) A few of the many thousands of our precision parts that help "Keep 'em flying and fighting." Let's all back the attack—Buy EXTRA War Bonds.

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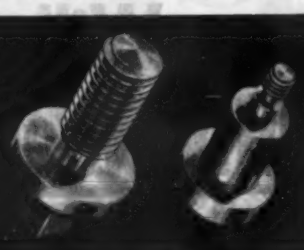
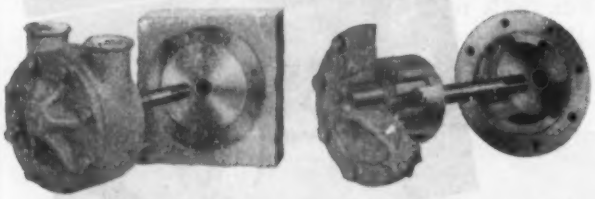
SCREW MACHINE PRODUCTS CO., INC.

25 LAFAYETTE STREET, BROOKLYN 1, N. Y.





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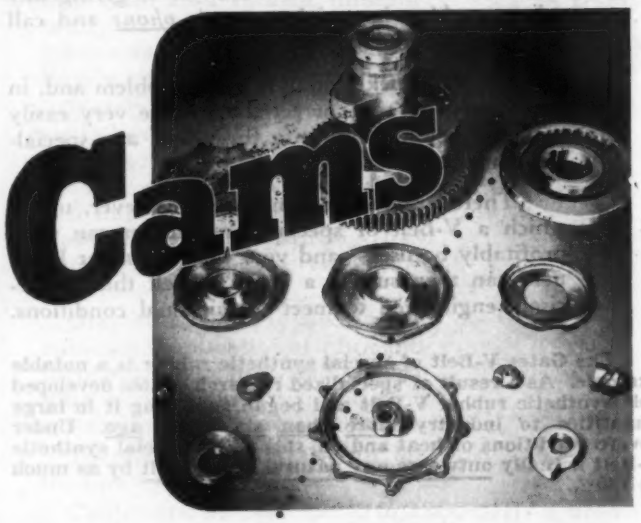
how TUTHILL PUMPS can be built into the design of your machine

To save space, material and money, Tuthill builds stripped pumps for you to incorporate directly into the design of your machine. These internal-gear rotary pumps are furnished without mounting bracket or without housing as pumping elements —for coolant, lubrication, hydraulic and liquid transfer service. Capacities from 1 to 50 g.p.m. Write for Tuthill Stripped Pump Bulletin.

★ Tuthill Pumps are serving Army • Navy Air Force • Merchant Marine and Industry

TUTHILL PUMP COMPANY

939 East 95th Street • Chicago 19, Illinois



● **25 YEARS** of experience in making special cams for thousands of companies has made us experts at cam cutting and grinding. Our facilities and equipment, the most complete of any plant in the country, permits us to manufacture any style or size of Cam, Geneva Motion, or Scroll Plate in quantities of 1, 10 or 10,000. Accuracy can be held to split thousandths, and surfaces to micro-finishes. Send us specifications or blueprints and we will be glad to submit a detailed quotation to you on your requirements.

KUX MACHINE COMPANY

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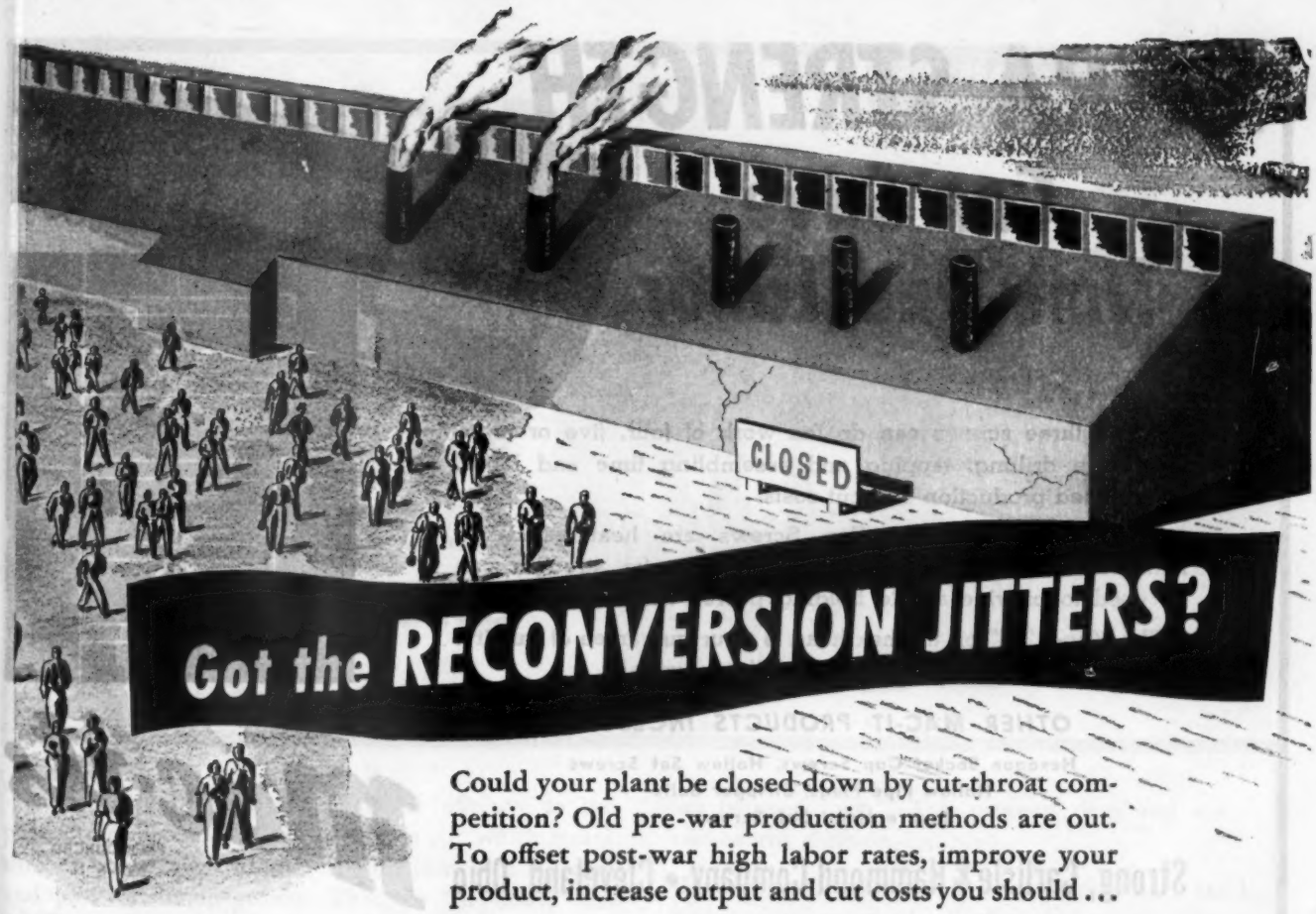


Got the RECONVERSION JITTERS?

Could your plant be closed down by cut-throat competition? Old pre-war production methods are out. To offset post-war high labor rates, improve your product, increase output and cut costs you should...

Use Die Casting as a Machine Tool

As the shortest distance from raw material to finished product, die casting...when used as you would use any other machine tool... offers unbelievable economies in all types of metal goods fabrication. Based on the outstanding advancements made during the war, "Red" Harvill now offers his "Complete Die Casting Package Plan"...a production plan which is a sure cure for reconversion jitters.

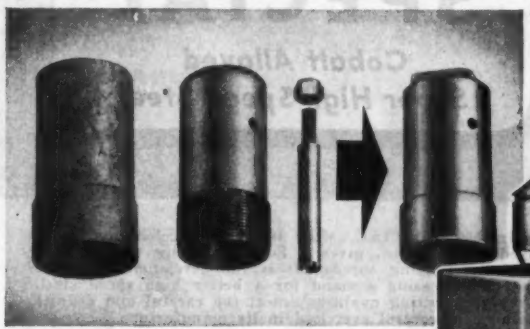
See RED and be ready

Start now to plan your post-war production, but be sure your plans will make you competitive in your post-war markets. Discuss unlimited possibilities of die casting your product with "Red" Harvill now and be ready for reconversion.

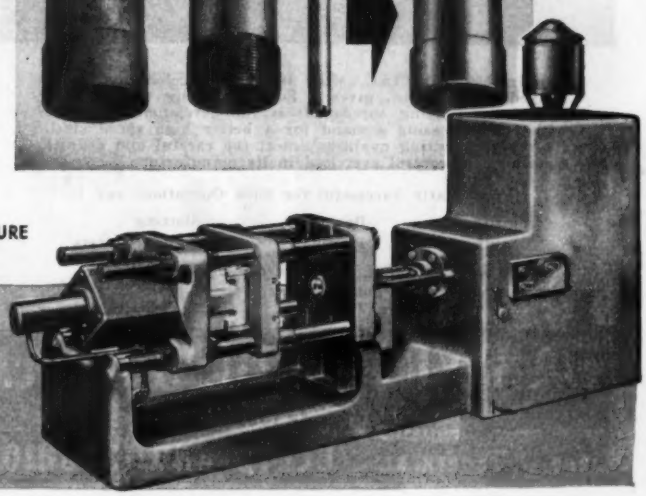
Die casting equipment as a tool in your production line will cut costs, increase output, reduce investment and inventories. Write for descriptive catalog on your firm letterhead.

Die Casting Saved 75%

Case History No. 103. Conversion to die casting eliminated all machine operations except threading O. D., eliminated through-bolt spring guide. Costs cut 75% on 50,000 pieces.



SEND FOR FREE "PACKAGE PLAN" BROCHURE ON YOUR FIRM LETTERHEAD



H. L. HARVILL MFG. CO.

POST OFFICE BOX VERNON, CALIFORNIA

EXTRA STRENGTH
Can Save Time and Labor

When three screws can do the work of four, five or more they save drilling, tapping and assembling time and labor. They speed production and cut costs.

Mac-it Hexagon Head Cap Screws are heat-treated for maximum strength and toughness. This extra strength can be used to provide ample holding power with fewer screws.

The Mac-it "m" on the hex head is your guarantee of quality. It appears on all diameters ¼" to ¾", inclusive.

OTHER MAC-IT PRODUCTS INCLUDE:

Hexagon Socket Cap Screws, Hollow Set Screws
Hollow Pipe Plugs, Stripper Bolts
Square Head Set Screws

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Mac-its
PRONOUNCED "MACK-IT"

Darwin

505 SPECIAL
Cobalt Alloyed Super High Speed Steel

Darwin 505 SPECIAL, with its higher cobalt-vanadium-molybdenum content, gives a longer wearing tool and allows faster cutting speeds. It is the development in line with the increasing demand for a better high speed steel. Its superior cutting qualities reflect the careful and definite metallurgical control exercised in its manufacture.

Particularly Successful for Such Operations as:

Turning	Boring	Slotting
Shaping	Planing	Milling Cutters

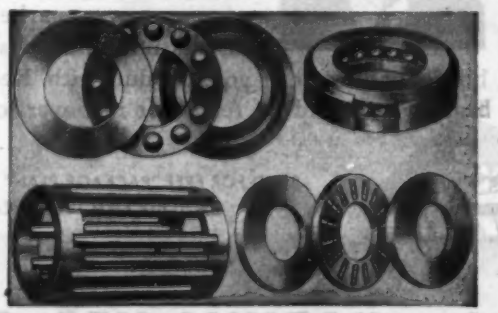
Furnished in Billets, Bar Stock and Ground Tool Bits.
Bulletin on Request

DARWIN & MILNER Inc.
highest grade tool steels
1260 W. FOURTH ST. CLEVELAND 13, OHIO

Those men in the plant want clean hands. But they want a fast acting cleaner. Give them speedy action PLUS the safety they overlook when they use harsh, harmful, cheap cleaners. Put Magnus Hand Cleaner in your washrooms and be confident that you have eliminated a serious source of skin infections and dermatoses!

Let us send a liberal trial package.

Magnus
MAGNUS CHEMICAL COMPANY
60 SOUTH AVENUE - GARWOOD, N. J.
INDUSTRIAL CLEANERS



B & R B

Precision Bearings have been recognized for many years for their dependability. These bearings can be selected from our catalog of standard sizes which are carried in stock.
THE BALL and ROLLER BEARING CO., Danbury, Conn.

"MAXITORQ"

FLOATING DISC CLUTCH

NO DRAG · NO ABRASION · NO HEATING

WINS APPROVAL OF LEADERS IN MACHINE TOOL MANUFACTURE

Machine tool operation is only as effective as the power transmission equipment permits . . . which means smooth engagement of the clutch, quiet, cool running and positive disengagement. That the "Maxitorq" has been selected by many leading machine tool builders is a tribute to its dependability under constant operation.

The reasons for such approval are:

1. Assembly, adjustment, take apart . . . without the use of tools . . . easily, quickly.

2. Floating Discs . . . which ride free in neutral . . . kept apart by Maxitorq Separator Springs . . . "you can see between them". This prevents drag and the consequent abrasion and heat.

This is the single and at top is the double "Maxitorq" clutch, both of which are available in Dry or Wet types. Pulley and Cut-off Coupling types also made. Capacities from ¼ to 5 H.P. at 100 R.P.M. Information about larger capacities on request.

3. Discs which have flat, true surfaces . . . accurate duplication of all disc thicknesses. This means no high or low spots under engagement . . . the entire surface area being engaged, with contact evenly distributed. Obviously clutch service life is greatly extended.

4. Adjustments for spring tension are quickly made by means of knurled ring, locked with a spring and notched retaining ring, to a proper setting. Again . . . no tools required.

Check these important advantages . . . they will insure better operation of all machinery where smooth power pick up and quick, positive disengaging are essential.

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THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER, CONNECTICUT

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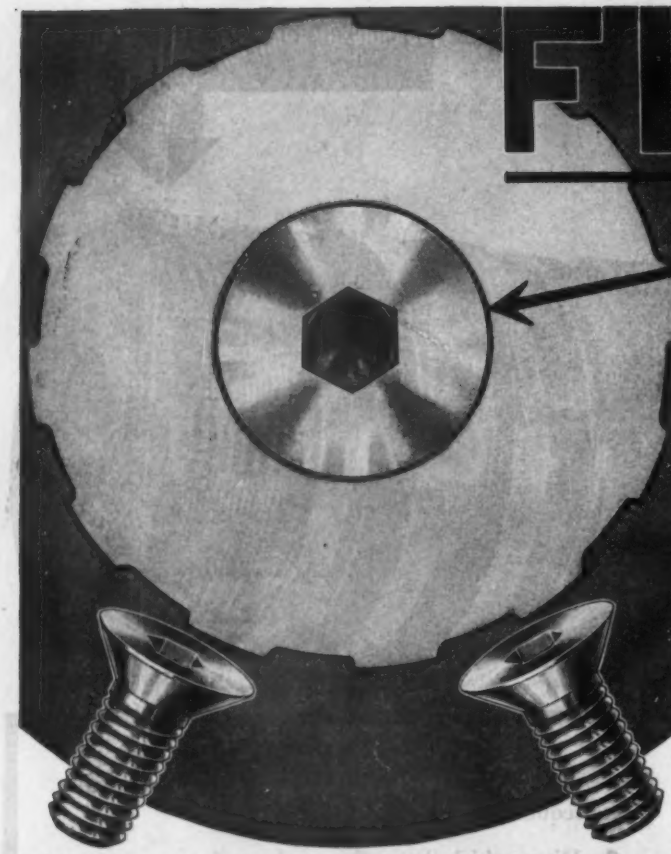

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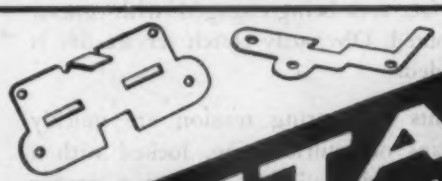
They set up in a counterbored hole more truly *flush* than any other type of hollow screw. The V-head fits the counterbore with complete *closed contact* all-round. This gives frictional holding-power and rigidity of grip... "Pressur-formd" of ALLENOY steel, with uncut metal fibres shaped to the head. Threads also *pressur-formd*, with tolerance held to a high Class 3 fit. Obtainable as a part of the ALLEN Line from your local Industrial Distributor. *Ask for samples* and dimensional data.

The Allen Mfg. Company ★ ALLEN ★ Hartford, Conn., U. S. A.



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Millions in use.

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Where there is machinery in motion, there is vibration, and vibration means strain to machine and to man. Lord Shear Type Mountings and other bonded rubber products control and isolate vibration.

Factories that are quieter, pleasanter, more efficient; automobiles, trucks, buses, locomotives, airplanes that are smoother and safer in operation; delicate laboratory equipment that is made more accurate and trust-worthy; these are the results that Lord is helping designers and manufacturers to accomplish.

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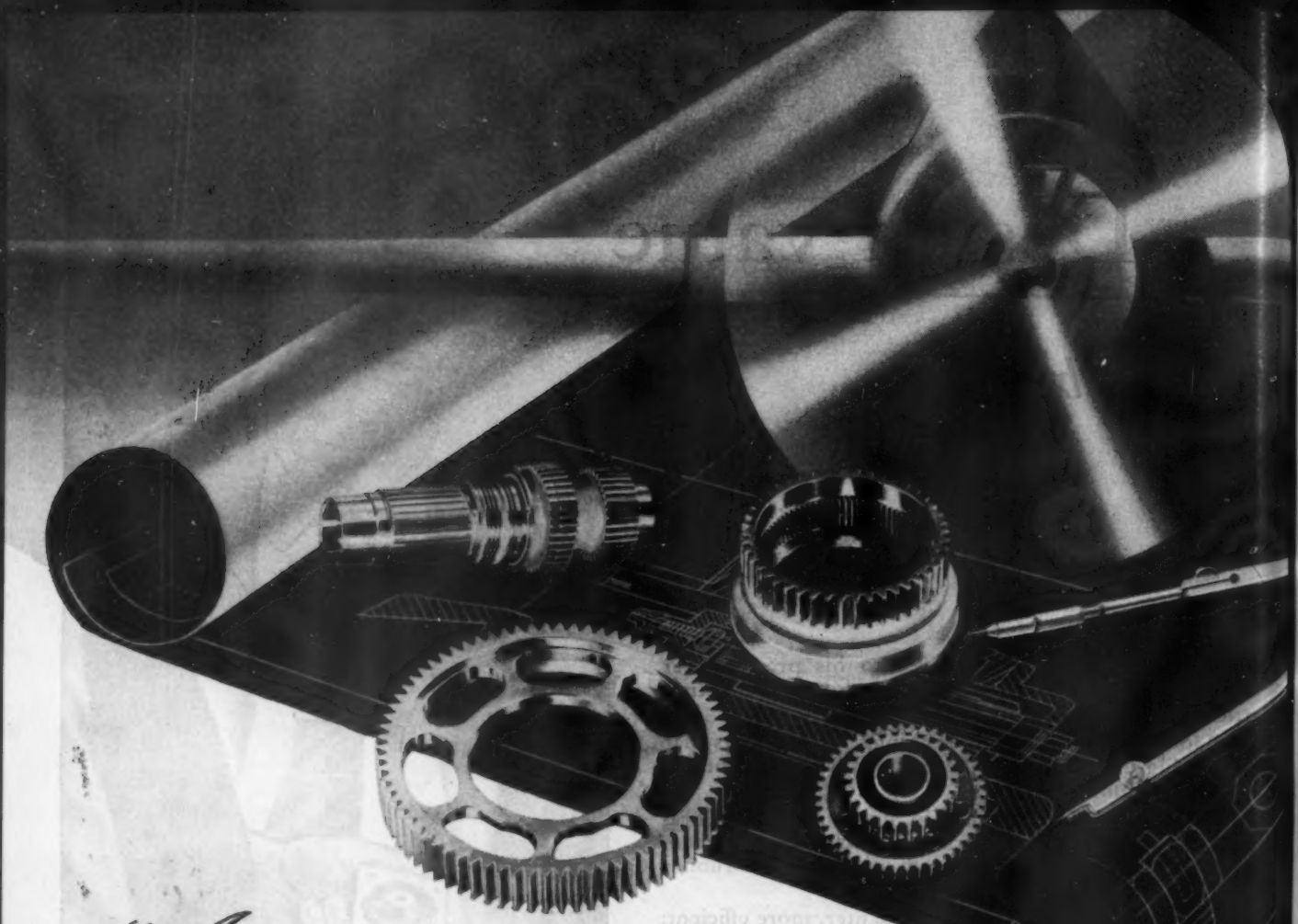

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OFFER ADVANTAGES FOR YOUR PRODUCT

War urgency demands the seemingly impossible of men and machines. Before the war the "aircraft quality" gears that Foote Bros. are today producing were hardly more than an engineer's ideal.

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"Aircraft quality" gears were developed to meet the exacting demands of the powerful Pratt & Whitney engines. Light weight and tremendous strength—the ability to stand high speeds and heavy loads, and yet assure long life were essential. Despite extremely thin sections, "aircraft quality" gears must carry tooth loads far in excess of values customarily considered safe design and must operate at pitch line velocities that can be measured in miles per minute.

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To aid your engineers in determining the advantages which "aircraft quality" gears will bring to your product, our engineering department is now developing an engineering manual which should be in the hands of every designing engineer—every production man—facing problems of power transmission. A copy will be sent on request as soon as it is ready.

* * *

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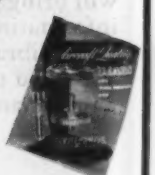

This informative product engineering manual on "aircraft quality" gears contains data on a new and revolutionary type of precision gear. A copy will be sent to you on request as soon as it is ready.

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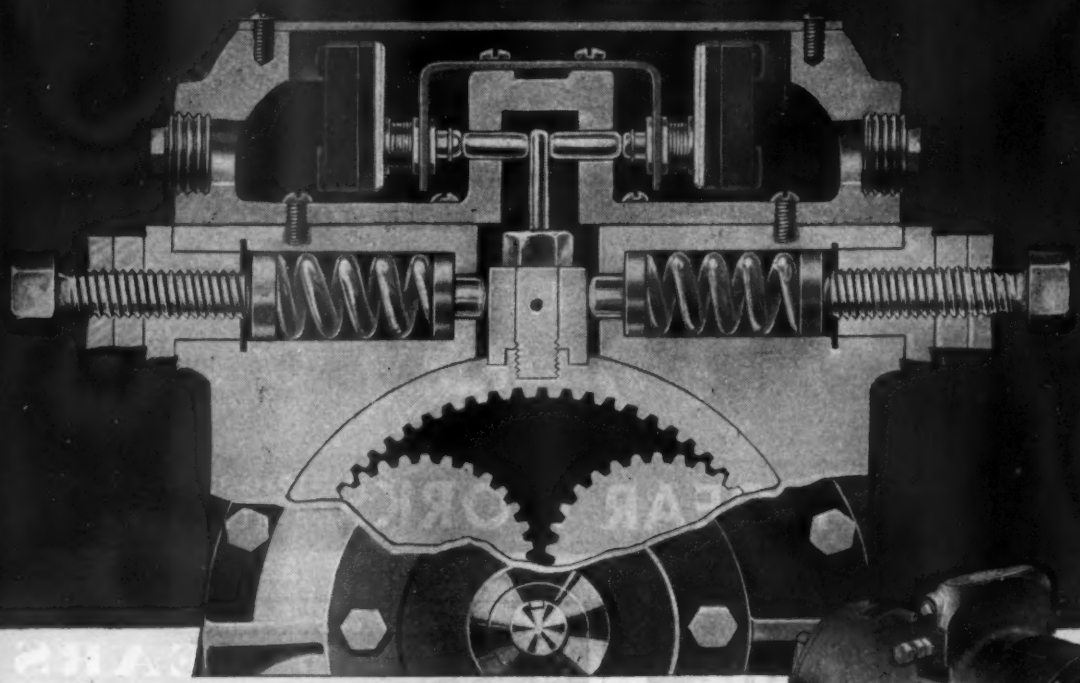


Responds to overloads more quickly than electrical thermal relays

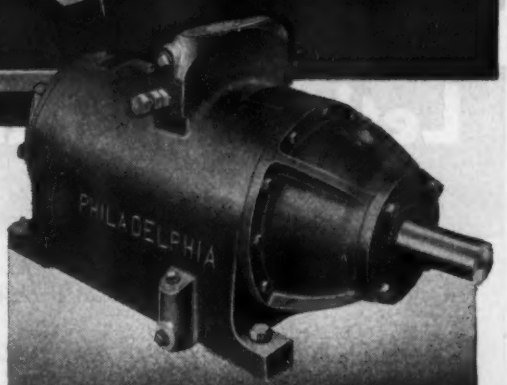
The PlaneTorque is a feature that can be incorporated into any Moto-ReduceR—*the built-in motor and speed reducer*—to protect both the driven machinery and the drive unit from overloads.

By direct mechanical action of the overload, motor current is automatically and instantly cut off when a pre-determined limit is reached. This action is quicker than electrical thermal relays provide. With fuse protection the fuses must be selected to carry the starting current of the motor. Therefore the protection during the running period is not adequate.

The PlaneTorque can be cut out during the starting period merely by holding down the starting button but will become operative during the running period when the button is released.

To restart the PlaneTorque-MotoReduceR after overload cut-off only removal of the excessive load is necessary . . . a big time saving feature.

For applications such as stoker drives, conveyor drives, mixers, roll drives, etc. . . . investigate the PlaneTorque MotoReduceR. Get our Catalog M. R. 40 for further details.



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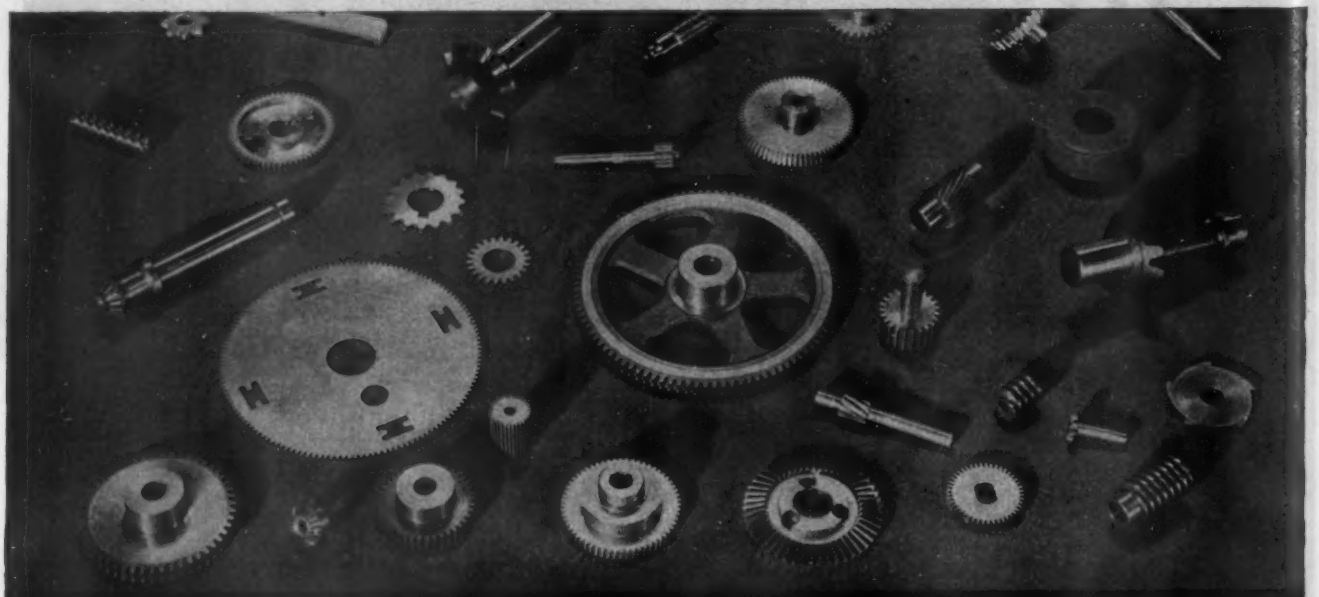

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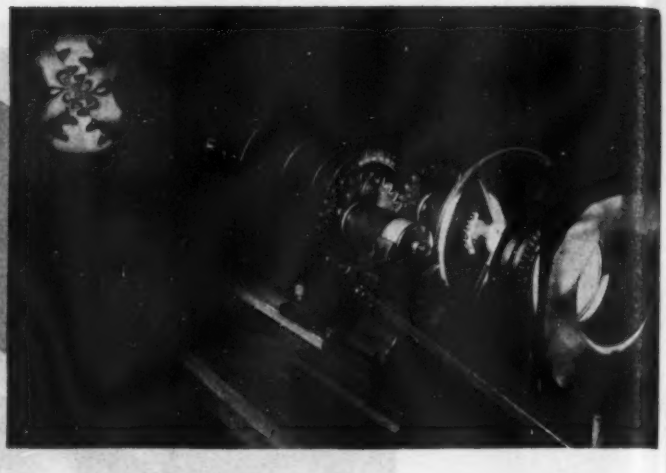

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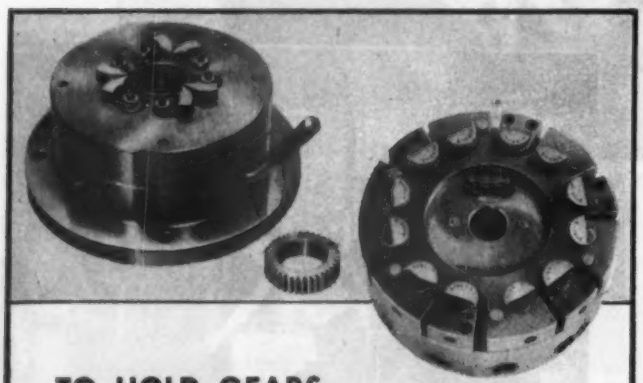

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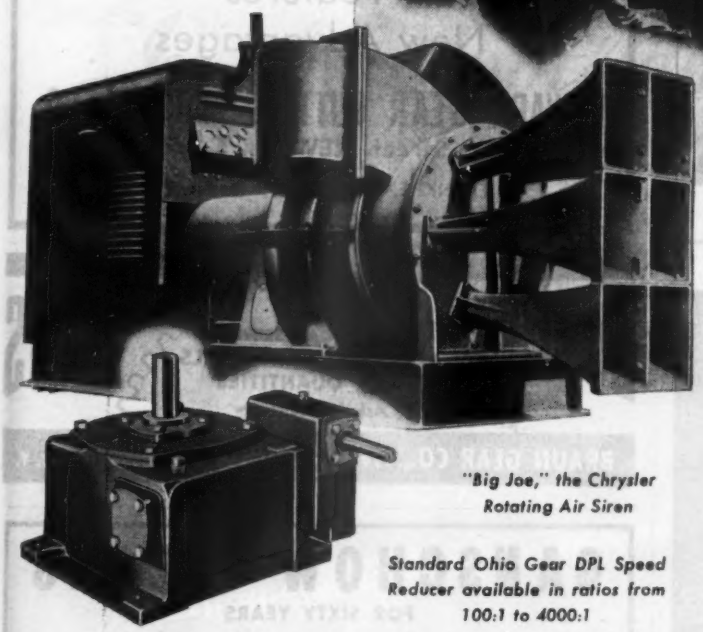
HELPS BLAST HOLES IN ENGLAND'S FOG!



"Big Joe," the Chrysler Rotating Air Siren

Standard Ohio Gear DPL Speed Reducer available in ratios from 100:1 to 4000:1

Maybe you've read about "Big Joe," the loudest mechanical sound in the world. Designed and built by Chrysler Corporation as an air raid siren, Big Joe has turned out to be the airmen's friend. Now, mounted at hundreds of air fields, that terrific voice actually blasts holes through fog.

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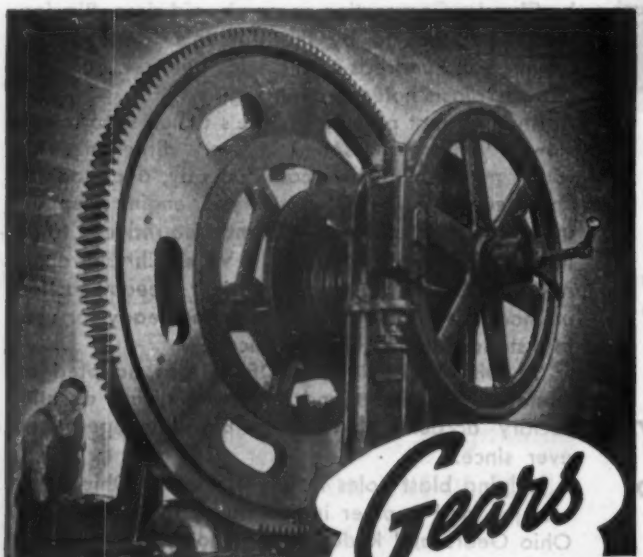

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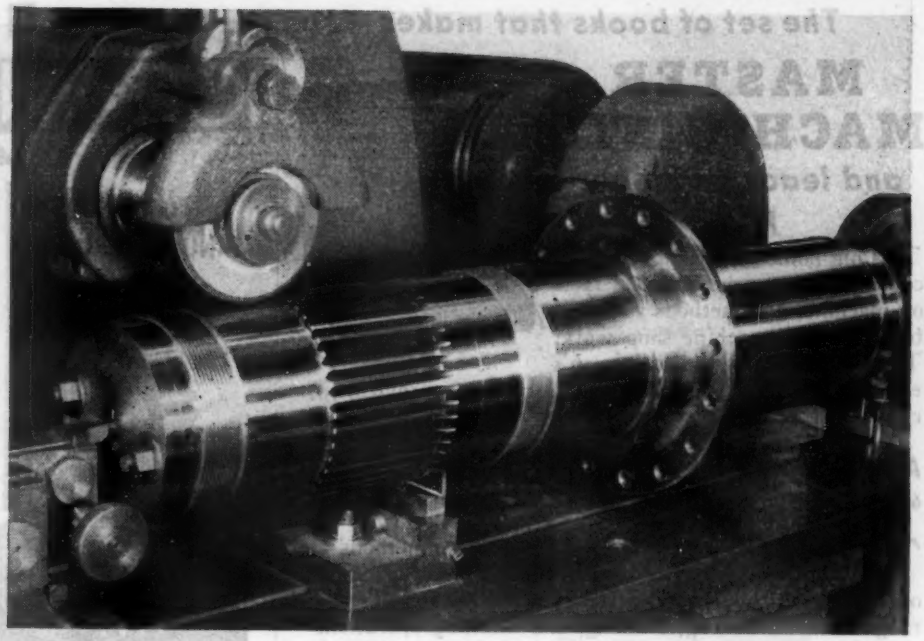

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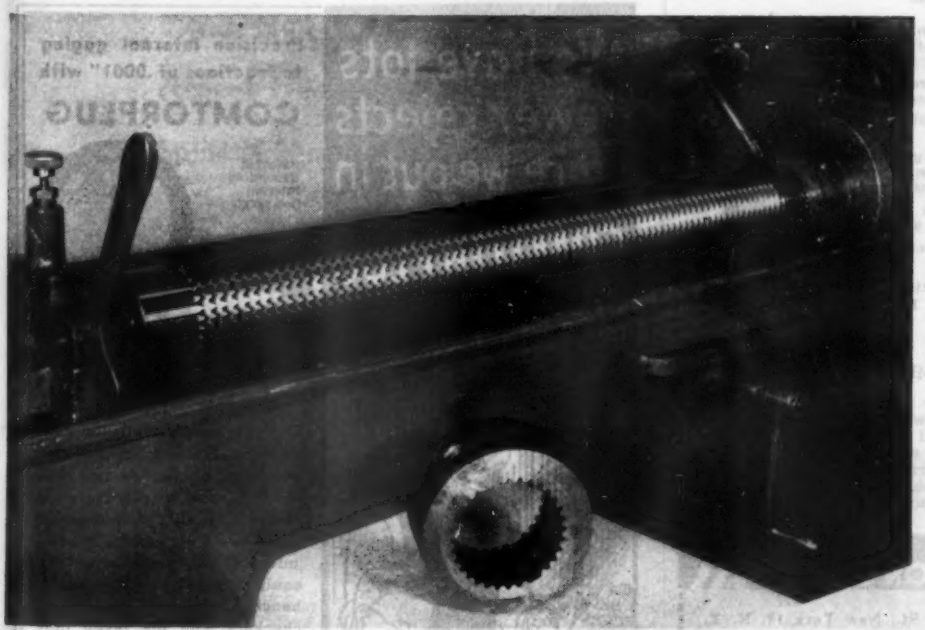

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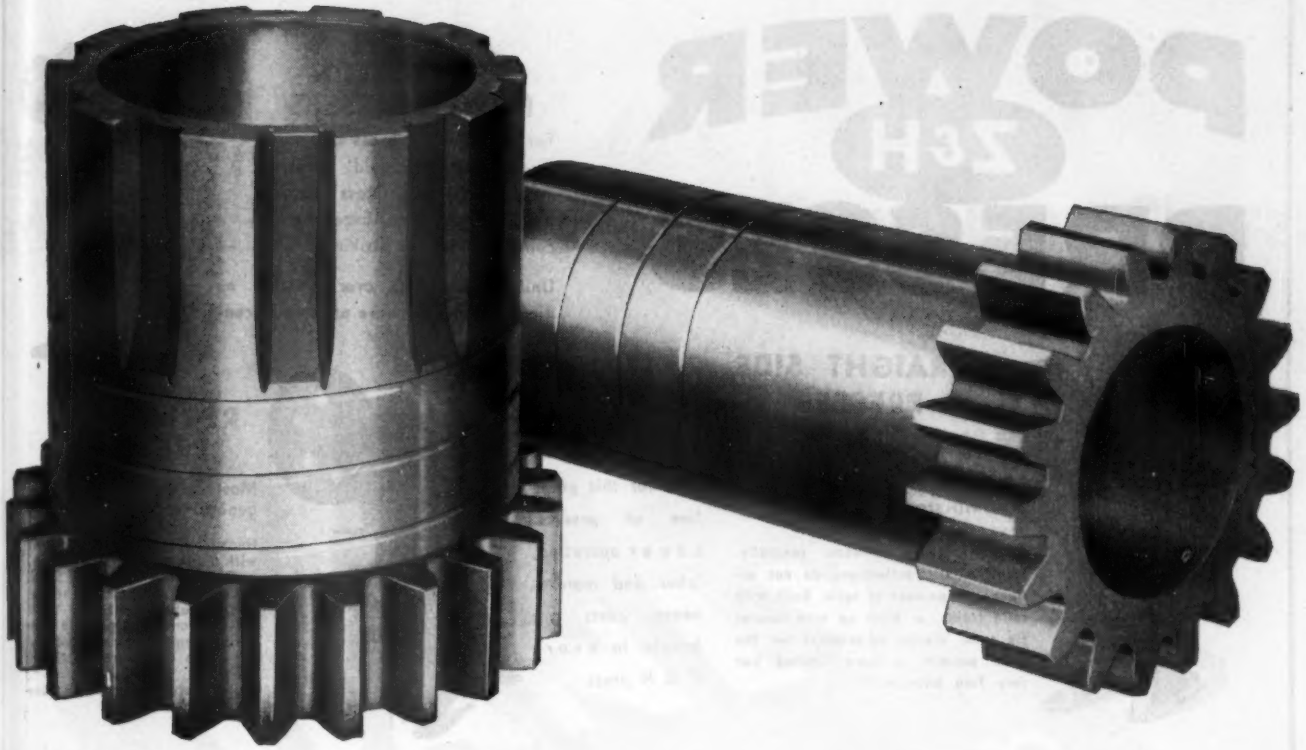

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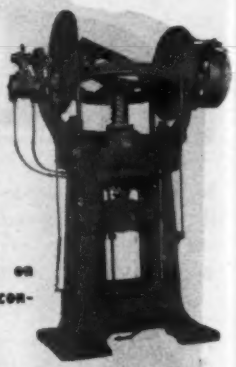

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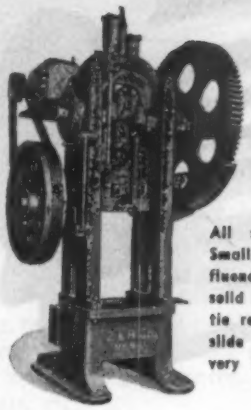

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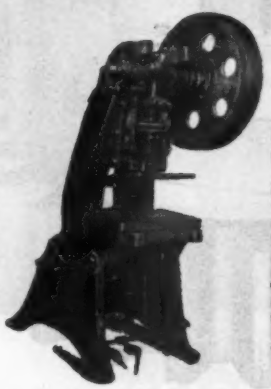
All stresses are taken centrally. Small elastic deflections do not influence alignment of tools. Built with solid frame, or built up with special tie rods. Wedge adjustment for the slide permits a more limited but very fine adjustment.

More than 40 years of specialized experience is responsible for this great line of presses. Lower operating, labor and maintenance costs are bought in every Z & H press.



RECLINABLE PRESSES

Most suitable press for general stamping work.

Heavy frame construction, with a strong, simple, durable, non-repeating clutch. Slide guided in long V-shaped jibs—carefully fitted. Ball joint pitman, adjustable for wear. Crankshaft designed for maximum pressure without springing. Reclines to 40°. Full safety equipment. Easy to operate.

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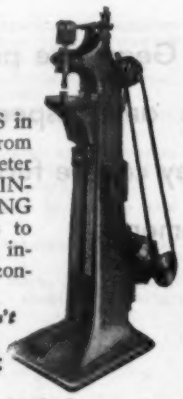
NEWARK 5, N. J.

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅜" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



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DIE SETS

AT LOWER COST

46 Styles—195,000 Sizes

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Machined Steel Semi-Steel

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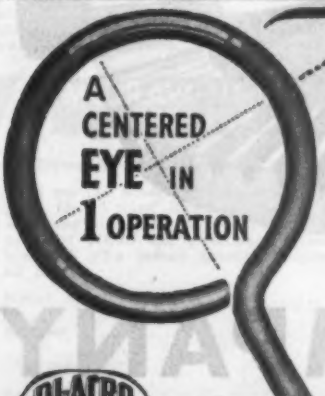
PRESSES
FEEDS
AUTOMATIC EQUIPMENT

The V & O Press Company, Incorporated

HUDSON, NEW YORK



Precision CENTERED EYE Bending

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

DI-ACRO Bender No. 1

Forming radius 2" approx. Capacity ¼" round cold rolled steel bar or equivalent. Also Benders No. 2 and 3, with larger capacities.

With DI-ACRO Benders

DI-ACRO Precision Bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

Send for CATALOG

"DIE-LESS" DUPLICATING showing many kinds of "Die-less" duplicating produced with DI-ACRO Benders, Brakes and Shears.

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Rapid, Positive Clamping, Maximum Open Clearance
DANLY
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TOGGLE CLAMPS
To Speed Assembly, Machining Operations, Metal and Plastic Stamping.
For complete data, including tested pressure figures, send for the new Kwik Klamp Catalog.
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WARTIME metal-working methods FORECAST PEACETIME advances

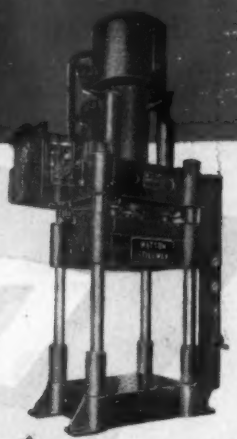
NEW HYDRAULIC PRESSES developed by Watson-Stillman for fast forming of shells, bombs, airplane propeller domes and fuel tanks, ship plates, and similar products vital to the war effort has added much valuable experience to an already broad "know-how" in designing and building hydraulic equipment for all kinds of metal-forming operations.

Substantial improvements that have been made by W-S engineers in design and construction of presses, and controls are sure to have a great influence on the economy and wide application of hydraulics in the production of post-war metal products.

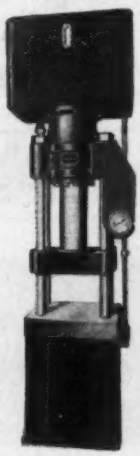
The Watson-Stillman Company is fortunately situated—due to its wide scope of war business—in being well posted on postwar possibilities for utilizing hydraulic presses of standard or special design. Its comprehensive line of hydraulic forming presses—built since Pearl Harbor alone—promises wider, more varied metal-working benefits to all major industries in the postwar period.

Only a few of the many available types and sizes of latest W-S Forming Presses are shown here. Write for detailed information on these and other W-S hydraulic presses for forming, forging, flanging, straightening, shearing, bending, piercing, nosing, assembling and other metal-working operations. The Watson-Stillman Company, Roselle, N. J.

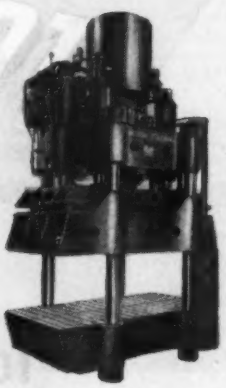
200-Ton Single Action Forming Press



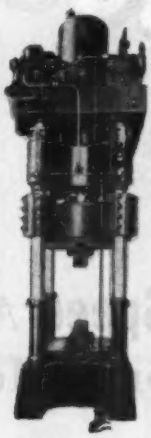
300-Ton Double Action Forming Press



75-Ton Utility Press



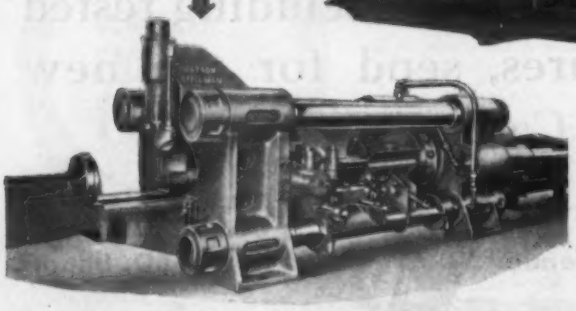
800-Ton Double Action Forming Press



500-Ton Forging Press

4500-Ton Rubber Pad Forming Press

1000-Ton Extrusion Press



WATSON-STILLMAN

Designers and manufacturers of Hydraulic Equipment, Forged Steel Fittings and Valves.

Here's AN ETNA TUBE CUT-OFF MACHINE...

DOING A TOUGH JOB THE EASY WAY!

The machine pictured here is representative of many ETNA Tube Cutoff Units that are speeding operations on jobs such as this one — cropping hot rolled tubing — and on shell and sleeve trimming . . . cutting lengths varying from 1/4" long to 50 feet or more!

Check the specifications listed below against your cutoff requirements. We're sure you'll find that an ETNA Cutoff Machine can handle your operations faster, more efficiently and more economically!

Outside diameter of tubing	5 HCO	2½ HCO
Max. wall thickness	Max. 5 in.	2½ in.
Range of Louis-Allis "Adjusto-Speed" motor	Min. 1½ in.	½ in.
a. Best operation range	⅜ in.	½ in.
b. Speed ratio of motor	0.1700 RPM	⅝ in.
Max. adjustment of individual tool holders (this includes stroke of ¾ in.)	425-1700 RPM	same
Max. stroke of tool	4.1	
Projection of Tool from tool holder	2½ in.	1⅝ in.
Dimensions of Tool	¾ in.	¾ in.
Ratio from drive motor to spindle	1 in.	⅞ in.
Spindle speed range	5/16 x 1 x 6 in.	⅛ x 1⅛ x 5 in.
a. Best operation range	5.73	4.69
Spindle speeds can be altered to suit Jaw liners and spindle liners to suit entire range of	0-300 RPM	0-360 RPM
Hydraulic operating pressure	75-300 RPM	90-360 RPM
	1½-5	¾ x 2½
	400-PSI.	400 PSI.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

Drop a line to ETNA today! Describe your operations or send blueprints. Our Engineering Department will be glad to demonstrate how and why ETNA Tube Cutoff Units handle cropping and trimming jobs faster!

The ETNA Machine Company

3400 MAPLEWOOD AVENUE

TOLEDO 10, OHIO

These KRW HYDRAULIC

Quantity production keeps KRW Hydraulic Press prices very low.

EQUIPPED WITH PATENTED KRW SPEEDI-BOOSTER AND USING LOW-COST DIES, THEY DO THE WORK OF EXPENSIVE PRESSES AND BENDING MACHINES ON SHORT RUN PRODUCTION

● Some of the manufacturing uses to which KRW Hydraulic Presses are being put today, are almost unbelievable in their originality and efficiency. Nevertheless, the versatility and adaptability of these air-operated presses is being profitably proven today by many factory and production executives. Heart of the New KRW Speedi-Booster Hydraulic Press is its sensitive finger-tip control mechanism which instantly governs ram movement—lower, raise or stop. With a few simple and inexpensive dies these KRW Presses can be adapted to a wide variety of bending and pressing operations requiring pressures from 5 to 75 tons. Air pressure varying from 80 to 225 pounds is required—resulting hydraulic pressure varies with air pressure used. Built-in air regulator permits exact duplication of pressure at each stroke... important in many types of fast production. Available for either vertical or horizontal operation. Quick delivery on all sizes. Write for KRW Hydraulic Press Bulletin. Our Engineers are at your service. We also manufacture suitable capacity air compressors.

SEND FOR THIS 24-PAGE ILLUSTRATED HYDRAULIC PRESS CATALOG ...full of valuable data!

K. R. WILSON
11 Lock St., Buffalo 2, N. Y.

Please mail me a copy of your Hydraulic Press Catalog.

Name.....

Address.....

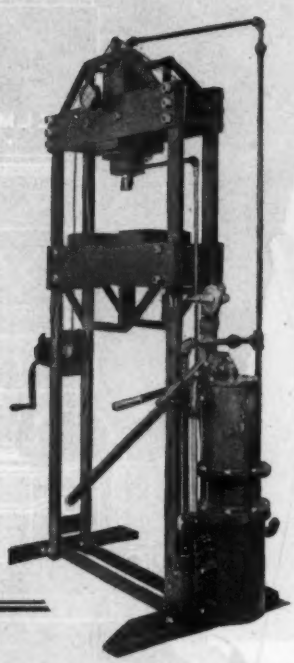
City..... *State*.....

PRESS FEATURES ARE *"Like Money in the Bank"*

PRODUCED IN QUANTITY

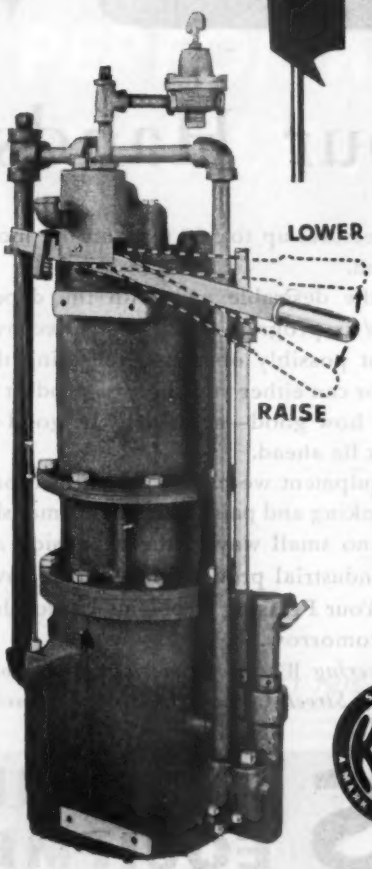
They give you . . .

1 LOW INITIAL COST
2 LOW OPERATING COST
3 FAST, FLEXIBLE OPERATION
4 LOW DIE COSTS



75-ton KRW Press equipped with patented Speedi-Booster and Finger-tip control.

This crank handle . . . required in small lots . . . is completely formed in two operations with the aid of low-cost v-shaped die and matching ram head. To conserve space, a horizontally operated press is used for this and other small work. Dies were made from scrap steel welded and machined.



THE REASON WHY KRW PRESSES ARE FAST AND ACCURATE.

The KRW Speedi-Booster elimates the need for the conventional Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.

AVAILABLE TONNAGE PRESSURES
25-50-60 TON PRESSES

AIR PRESSURE	7" AIR CYLINDER		9" AIR CYLINDER	
100 TO 200 POUNDS	2" Oil Cylinder	1¾" Oil Cylinder	2" Oil Cylinder	1¾" Oil Cylinder
	10 to 22 Tons	14 to 29 Tons	17 to 35 Tons	23 to 47 Tons

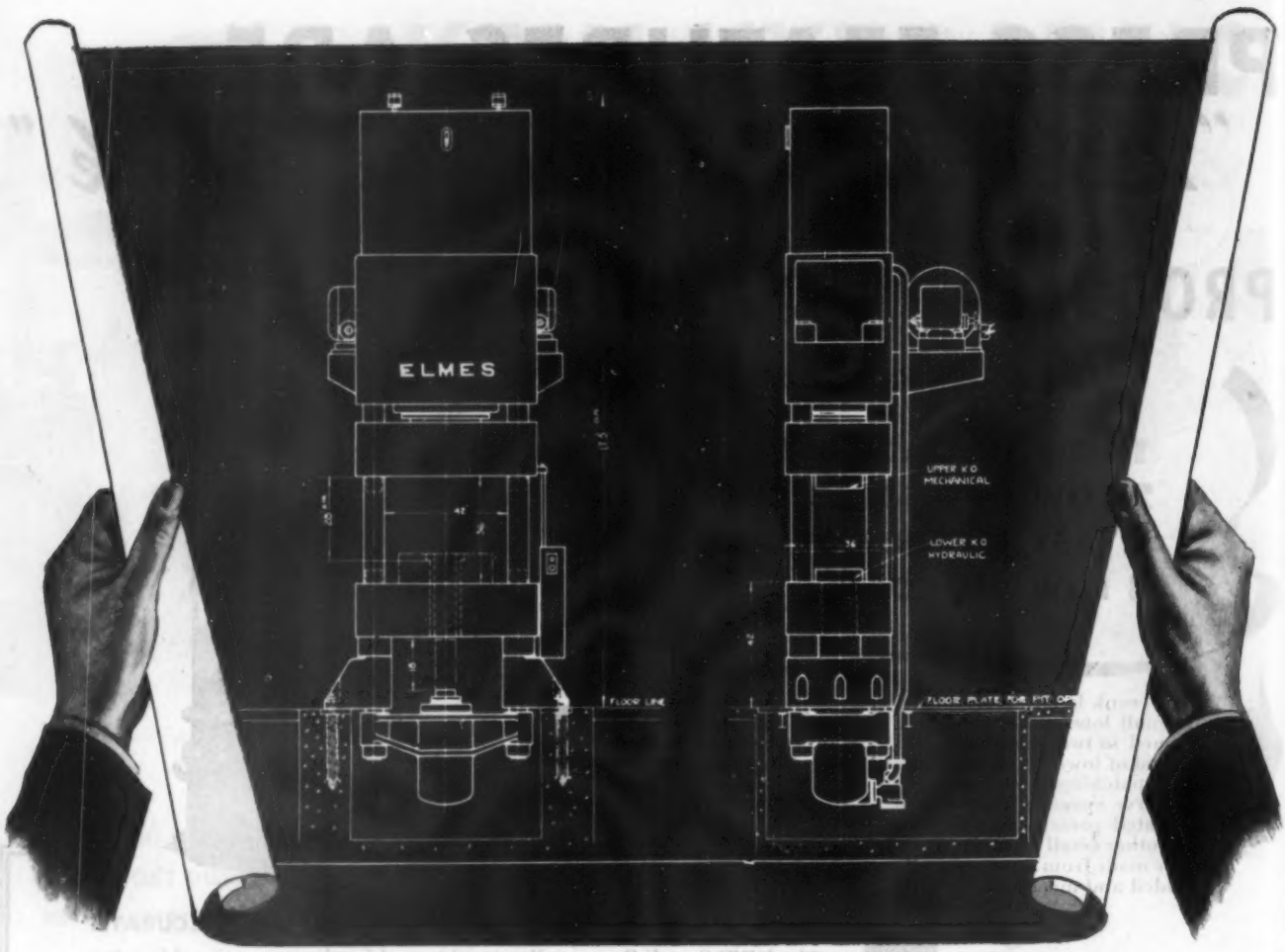
75 TON PRESS

AIR PRESSURE	9" AIR CYLINDER	
100 TO 200 POUNDS	2" Oil Cylinder	1¾" Oil Cylinder
	25 to 51 Tons	33 to 68 Tons

Write Today for the
KRW HYDRAULIC PRESS CATALOG

SINCE 1918 KRW A MARK OF DEPENDABILITY

K. R. WILSON
BUFFALO 2, NEW YORK



Tomorrow Is in Your Hands

Elmes engineers don't believe in the theory that "tomorrow never comes." Looking ahead has been their business for nearly a century, and each "tomorrow" has proved the wisdom of their viewpoint.

Tomorrow you will want even greater working speeds; more versatile equipment; exact accuracy and—above all—simplicity of operation. These things you can have in Elmes presses, and you won't have to wait too long. Already, new designs are in the shops for the building of pilot models.

One of these new developments is the combination compression and transfer plastics molding press shown above. The loading cylinder is at the bottom in full view of the operator. Pump, motor, and control valve are mounted aloft to save floor space. The press has both top and bottom knockouts, the latter hydraulic, and exceptionally high speed for quick closing of molds and injection of materials.

Operating controls include variable automatic time cycle with breather interval; adjustable stroke; selective pressing speeds; and pressures up to 500 tons on the mold, 150 tons on injection.

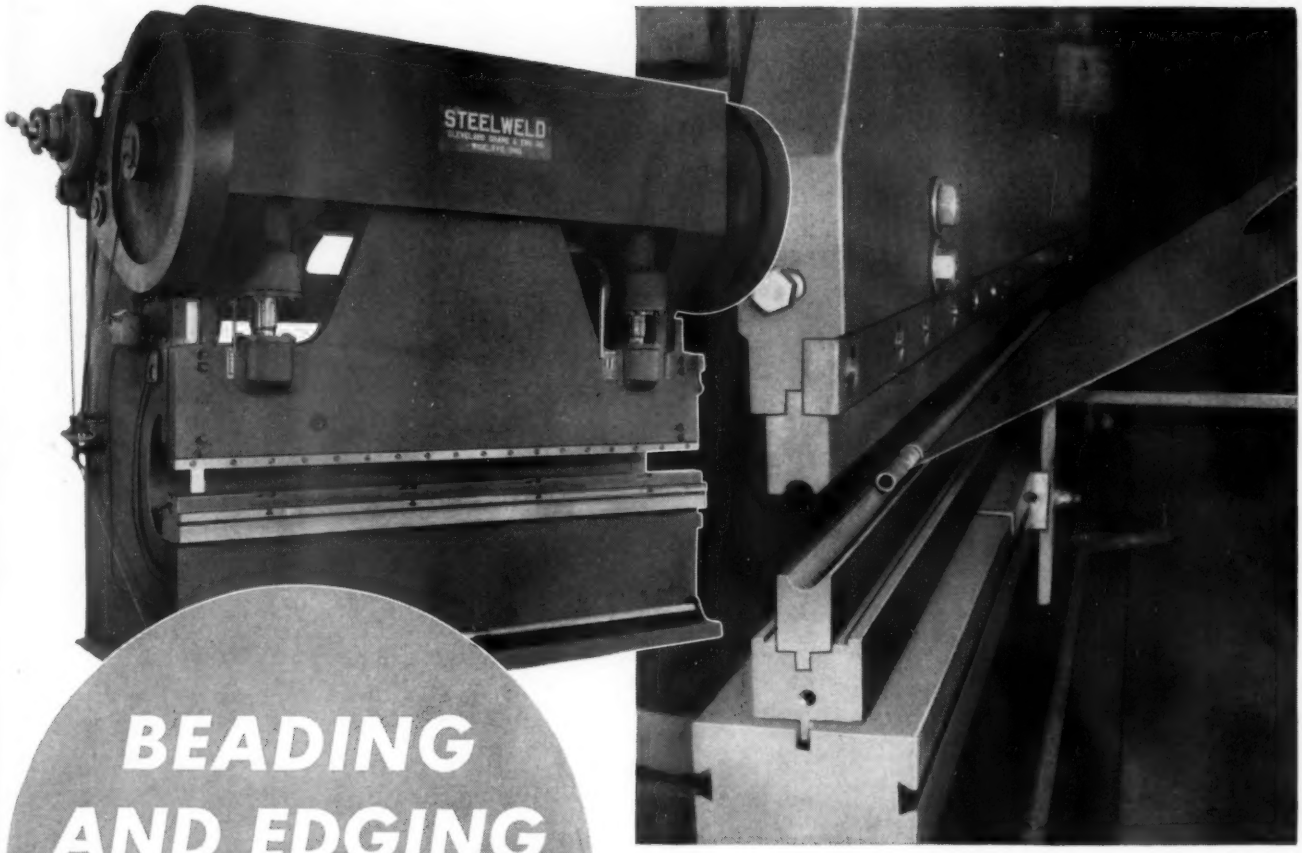
Combining the desirable *new* with the dependable *tried-and-proved* is progress at its best. Reconversion, in itself, cannot possibly obsolete everything that has gone before, nor can either your prewar product or ours—regardless of how good—necessarily be good enough in the days that lie ahead.

For Elmes equipment we pledge a continuation of the progressive thinking and painstaking craftsmanship that contributed in no small way to the expansion and improvement of industrial production. And we invite you again to "Put Your Pressing Problems Up to Elmes" in preparing for tomorrow.

Elmes Engineering Works of American Steel Foundries, 1001-1013 Fulton Street, Chicago 7. Also manufactured in Canada.

ELMES HYDRAULIC EQUIPMENT

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES



This illustrates how simple it is with a Cleveland Steelweld to wrap the edge of a steel panel around a pipe to secure rigidity and good product appearance.

BEADING AND EDGING PERFORMED EASILY . . . ON STEELWELDS

Beading and edging operations are only a few of the many types of work that are easily performed on Cleveland Steelwelds. Bending, forming, louvering, punching and notching are done with equal facility.

Steelweld Presses are so designed that dies may be changed easily. Gauges and indicators provided, make it simple to obtain identical results repeatedly, with a set of dies.

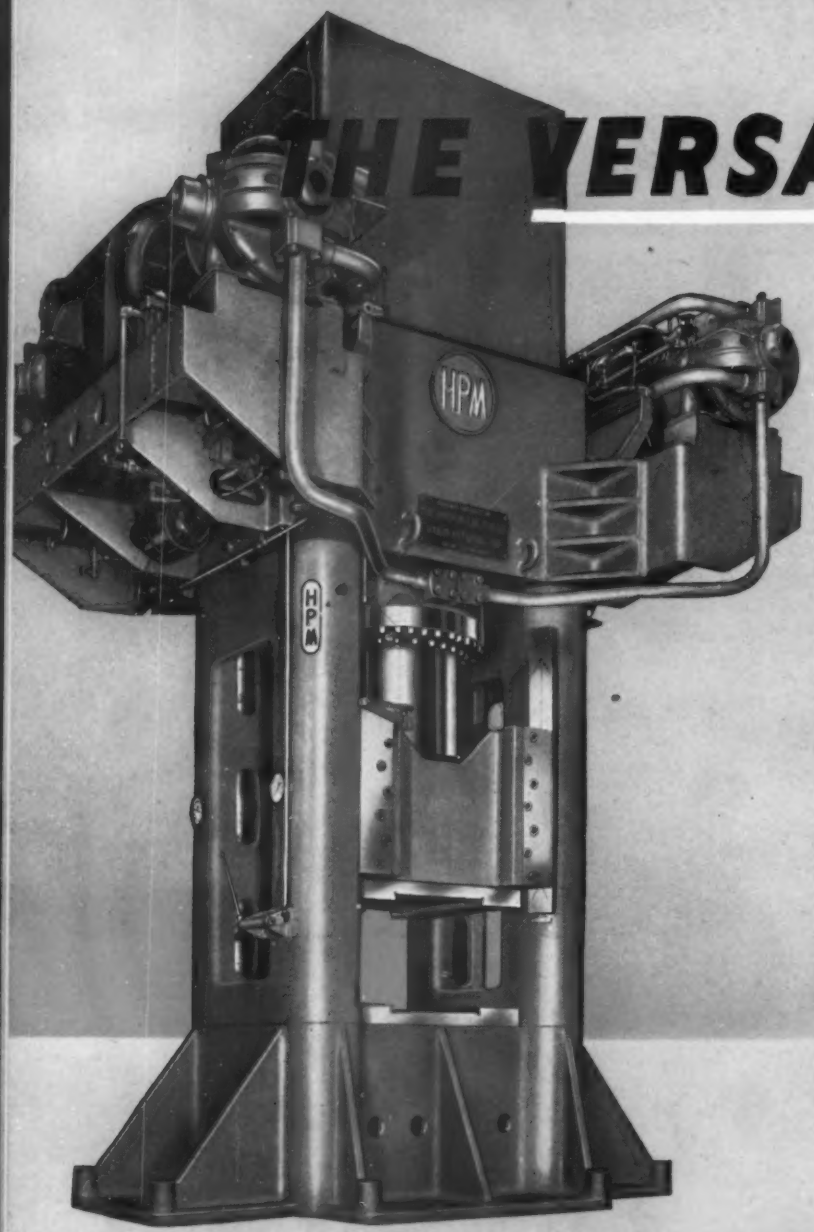
A complete line of Steelwelds is available for plates of all thicknesses up to one inch and lengths to 20 feet. If you work with steel, aluminum or the many alloy metals, it will pay you to investigate the possibilities of these modern presses.

GET THIS BOOK!
CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated

THE CLEVELAND CRANE & ENGINEERING CO.
1127 EAST 283RD ST. WICKLIFFE, OHIO.

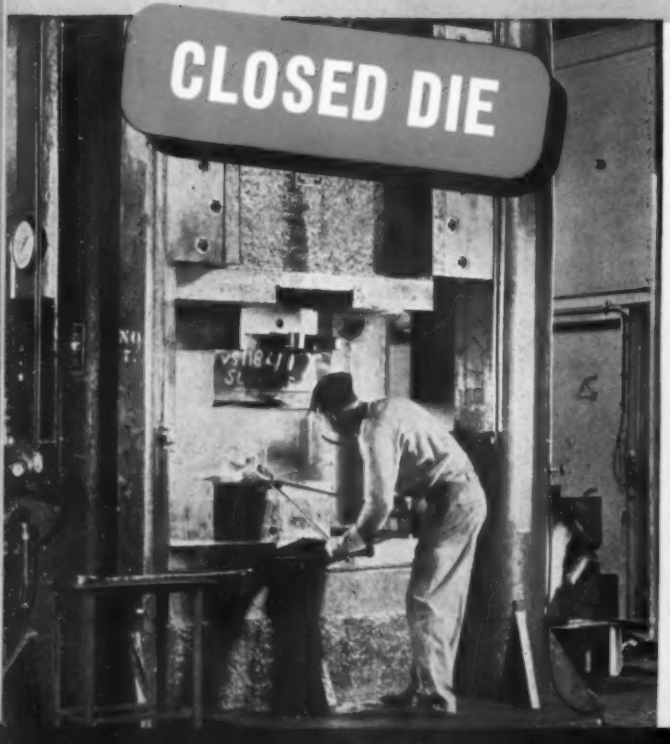
CLEVELAND
STEELWELD PRESSES
GENERAL SALES AGENTS: THE CYRIL BATH CO., E. 70TH & MACHINERY AVE., CLEVELAND

THE VERSATILE H-P-M "C
FORGING P



Speed, flexibility, versatility and a high degree of control make the H-P-M "All-Hydraulic" press the ideal machine for diversified forging work. In a great majority of cases, the H-P-M FASTRAVERSE forging press can do the work of three different machines, viz. hammer, upsetter and mechanical forging press. H-P-M presses also are ideally suited for hot forming and trimming.

When H-P-M forging presses are employed, impact stresses are negligible. A steady squeeze pressure kneads the metal as it flows. The structure, grain flow and strength of H-P-M press forgings compare equally with those produced by impact forging machines. Normally only one stroke of the press is required to perform the forging operation. Due to the fact that speed, pressure and travel



"All-Hydraulic"

© 1944 H-P-M MFG. CO.

PRESS

are under absolute control, H-P-M press operators need not be skilled workmen.

Each H-P-M press is completely self-contained. Installation necessitates only the connections of electric current and cooling water. No steam boilers, accumulators or intensifiers are required. Both press and operating system, including the compact oil-hydraulic radial pumps are designed and built by H-P-M, guaranteeing undivided responsibility to the user.

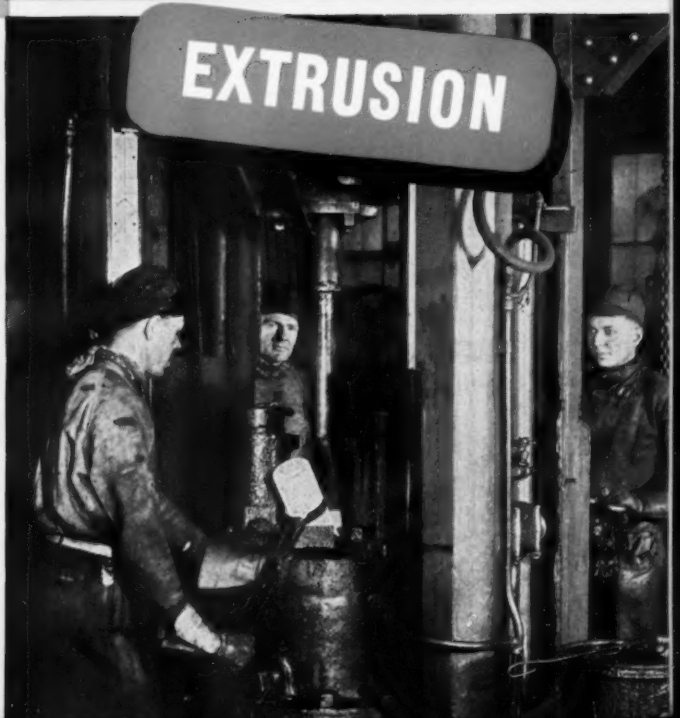
Investigate these revolutionary H-P-M "All-Hydraulic" forging presses. They will lower your manufacturing costs. Write today, stating your particular requirements.

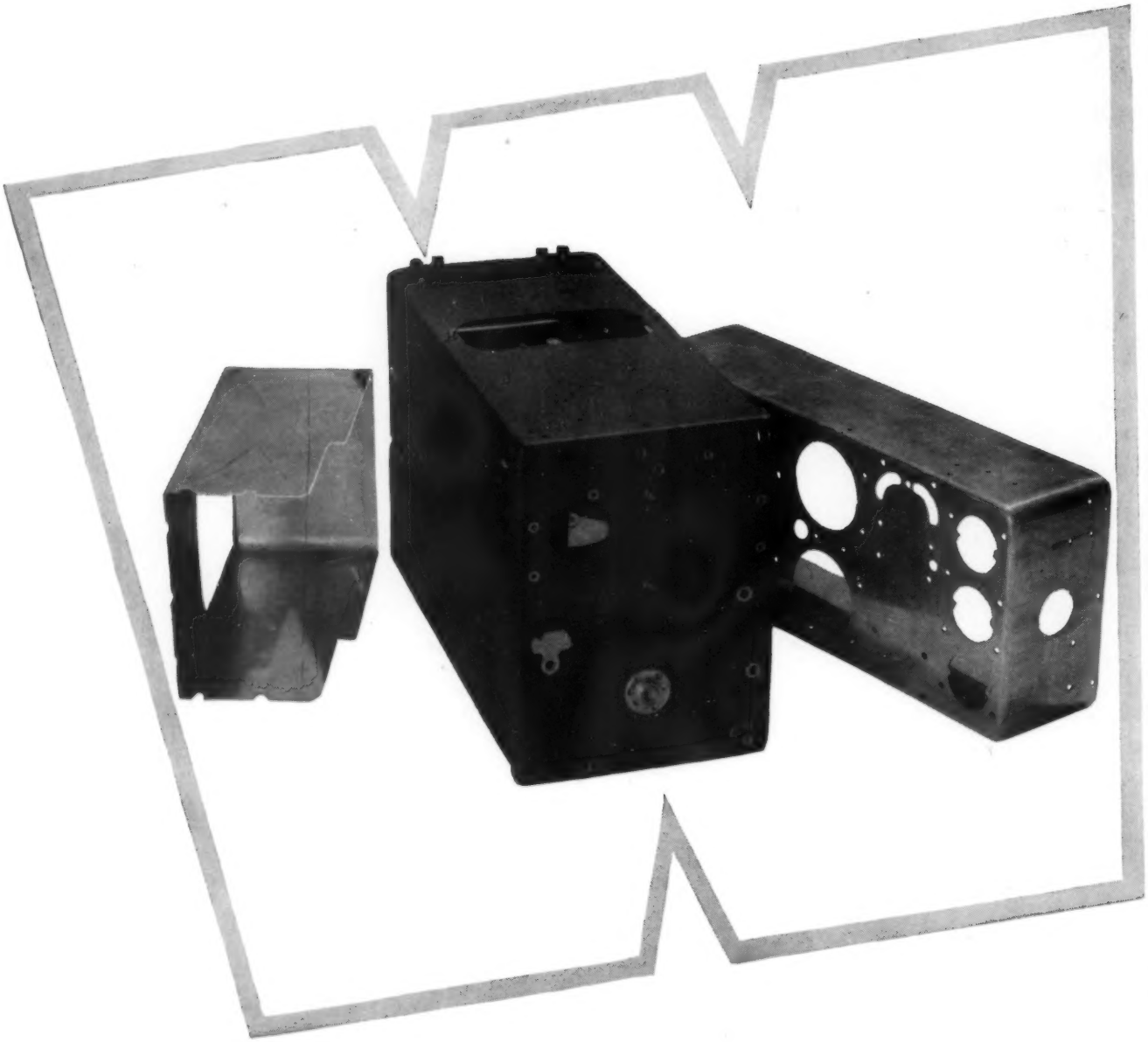
THE HYDRAULIC PRESS MFG. CO

Mount Gilead, Ohio, U. S. A.

Branch Offices — New York, Philadelphia, Cleveland, Detroit and Chicago.

Representatives in Principal Cities.





Close Tolerances in Light Gauge Aluminum Stampings

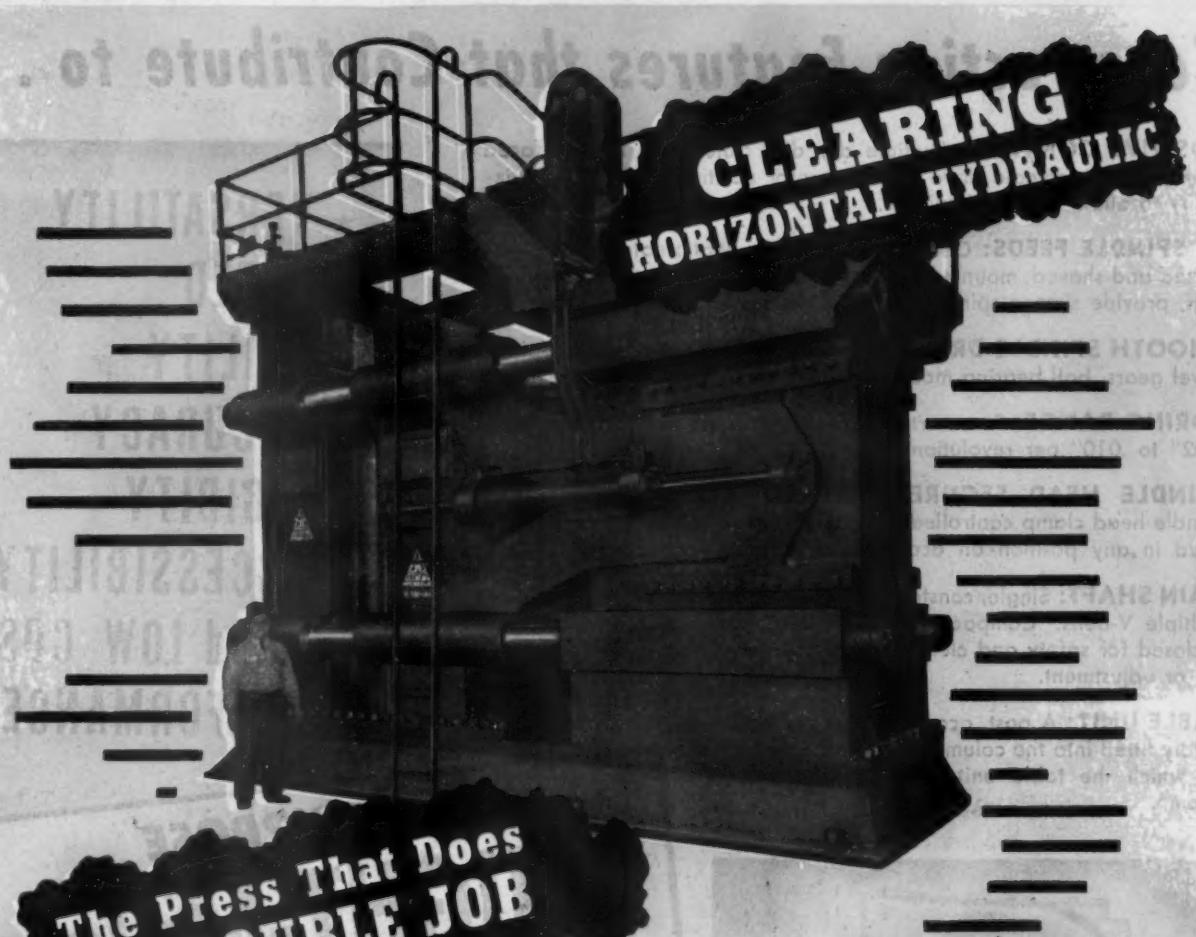
Stamping 100,000 intricate parts a month for Airborne Command radio sets is definitely a job for a plant with unusual facilities and thorough experience. All holes in these parts must be held to very close tolerances to prevent rattle under severe vibration. The small section shown is stamped from .020" aluminum 52S. All corners are accurately and smoothly rounded without cracking.

Why not investigate Presteel possibilities for lowering costs and improving production on your own products by the use of metal stampings? Mail samples or prints to

WORCESTER PRESSED STEEL CO.

212 Barber Avenue, Worcester 6, Mass.

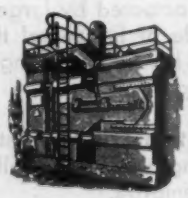
ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883



CLEARING HORIZONTAL HYDRAULIC

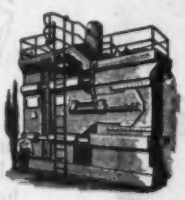
The Press That Does A DOUBLE JOB

More and more often Clearing engineers are assigned a problem in press design where meeting the requirements of a production work-handling sequence is as important as solving the technicalities of the work cycle itself. Perhaps there are places now on your own production line where a major improvement in a production step requires a new method of bringing the work to a machine.



Clearing engineers have repeatedly shown that problems like these do have a practical solution. The press above is one of many like it that do the double job of (1) performing a production operation and (2) fulfilling the requirements of a new between-machine handling sequence.

This particular press is a Clearing 500-ton horizontal hydraulic for use in the hot forming of hollow steel propeller blades. The horizontally moving ram closes on the work, and after the dies are closed, a compressed inert gas is admitted into the open end of the hollow blade; the compressed gas forces the walls of the blade against the die surfaces to form an accurately shaped propeller blade. This operation, due to the overall shape of the blade, causes an extremely eccentric distribution of pressure on the die surfaces. The dies, however, are held in exact parallel position by the unusual construction of the frame and double guided slide. The work cycle of the press is entirely automatic.



Typical of the way Clearing works is the design of this Clearing Horizontal Hydraulic to make possible a new and better method of bringing work to the press. Clearing engineers are experts at interpreting this thorough understanding of all phases of press practice in terms of your specific needs. Be sure to get their ideas and assistance when your production problems involve presses. Clearing Machine Corporation, 6499 West 65th Street, Chicago, 38, Illinois.

MECHANICAL AND HYDRAULIC PRESSES

for such operations as

DRAWING • BLANKING • FORMING • FORGING

CMC CLEARING

Construction Features that Contribute to . . .

POSITIVE CONTROL: Multiple dry disc clutch and leather faced brake in main spindle drive gives operator positive control with flexibility to allow "inching" spindle.

16 SPINDLE FEEDS: Gears of alloy steel, heat treated, finish machined and shaved, mounted on short, ground shafts and ball bearingings, provide sixteen spindle speeds, in either direction.

SMOOTH SPINDLE DRIVE: Hardened, ground, and lapped spiral-bevel gears, ball bearing mounted, make sure a smooth spindle drive.

BORING RANGE: Four vertical spindle feeds for boring range from .002" to .010" per revolution.

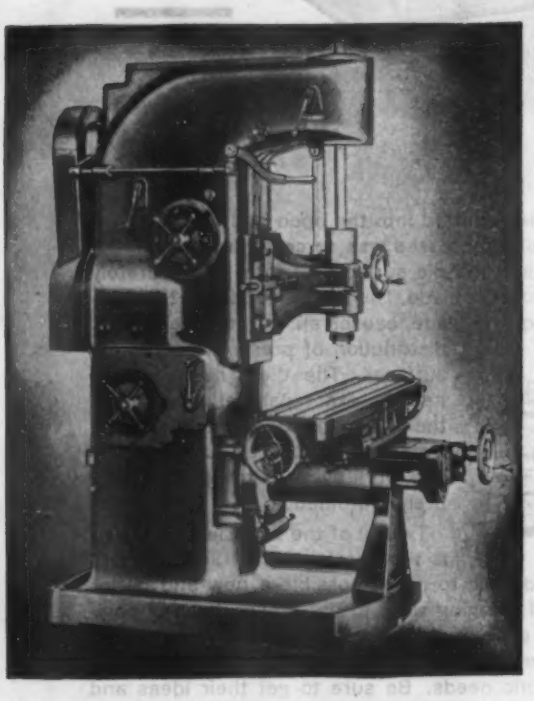
SPINDLE HEAD SECURELY LOCKED: Positive, quick acting spindle head clamp controlled by a single lever, securely locks spindle head in any position on accurately fitted slide on face of column.

MAIN SHAFT: Single, constant speed motor drives main shaft through multiple V-belts. Compact and accessible. Motor and drive entirely enclosed for safety and cleanliness. Guard easily removed for servicing or adjustment.

TABLE UNIT: A post, accurately ground and rigidly fitted into the column, forms the bearing on which the table unit swivels around the column.

★ VERSATILITY
★ SPEED
★ ABILITY
★ ACCURACY
★ RIGIDITY
★ ACCESSIBILITY and LOW COST
★ PERFORMANCE

ALL-PURPOSE KNIGHT-Millers



KNIGHT Millers are fast, compact, complete and convenient to handle. Write for our catalog that pictures and describes various jobs being done.

TILTING TABLE: Large trunnion, on which is assembled the table unit, provides for tilting table in either direction. This feature and the one above add to the capacity of the machine.

35° TILT: The knee, actuated by large worm and gear, may be tilted 35° either side of horizontal thereby placing the table in position for angle boring or milling. Four heavy T-slot bolts solidly lock it in any position.

SAFETY FEATURE: Automatic safety throwout, built into feed mechanism, provides against over-loading and will not allow re-engaging table feeds until overload is removed.

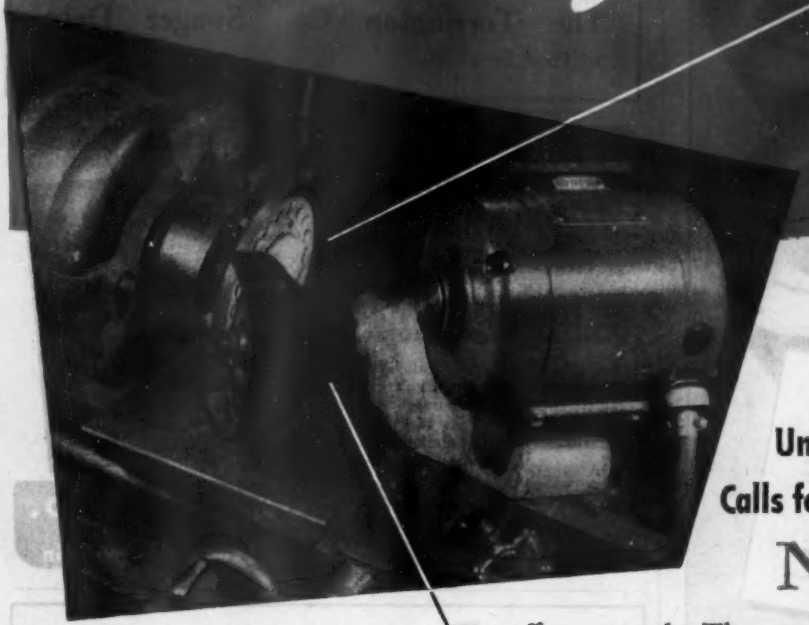
MAINTAINING SQUARENESS: Eccentric bushing, in outer table unit support bearing, furnishes additional means of maintaining squareness between table and spindle.

POSITION OF UNIT IN DEGREES: Large worm for operating gear that tilts table unit. Graduated segment on right side of unit gives position of unit in degrees.

KNIGHT Millers subject to prior order for immediate delivery. Write for catalog.

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •

Cutting TOUGH ONES Down to Size!



Work pieces are loaded in the twenty holes in the beveled rim of circular plate **A**. **B** and **B** are sample pieces.

Unusual Application of a Dumore Calls for Ruggedness Rather Than Precision

Nickel-steel alloy pins required cutting off at an angle. The metal being too tough for ordinary cutting, resort was made to grinding. Piecemeal operation was overcome by means of a circular loading device holding twenty pins which was chucked in a small lathe, mounting a No. 7 Dumore Grinder. With the fixture rotating at a moderate speed, the ends of the pieces were hogged off by the grinder in rapid-fire fashion.

Although built for high precision work, this application of the Dumore Grinder demonstrates its economy on jobs where ruggedness and speed are primary considerations. The Dumore Precision Grinder combines stamina with high speed and great precision, and because it can be utilized in combination with many standard machine tools, it increases their usefulness many times, and thus is found to be a highly profitable as well as a very useful tool

How other production men are making good use of Dumore's unusual versatility is shown by interesting words and pictures in our periodical "SHOP TALK." You will find many helpful suggestions in its pages. Ask to have it sent you regularly. Write today to The Dumore Company, Tool Division, Dept. TM14, Racine, Wis.

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PRECISION AND OFF-HAND GRINDERS

SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES

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CARTRIDGE CASE DIES . . . with Talide Nibs made of solid Tungsten Carbide, are producing millions of brass and steel cartridge cases in sizes 20 m/m through 105 m/m, small caliber bullet cases and jackets, and primer cups with better finish, longer life, closer tolerance, and fewer rejects . . . including cupping, drawing, heading, and tapering operations.
Talide Sheet-Metal Dies are also being used for deep drawing all types of metal products including tubes, cylinders, cans and containers.

Talide-Tipped Blades for centerless grinding screw machine products, multiple diameter shafts and spindles, and parts having special shapes or contours. Send for catalog No. 43-WP.

Talide-Tipped Tools for all types of turning, boring and facing operations on steels, cast iron and non-ferrous metals and non-metallic materials. Send for catalog No. 43-T.

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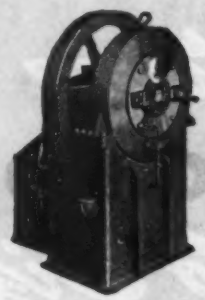

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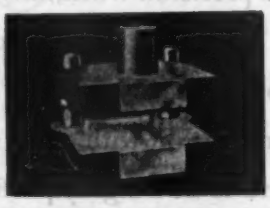

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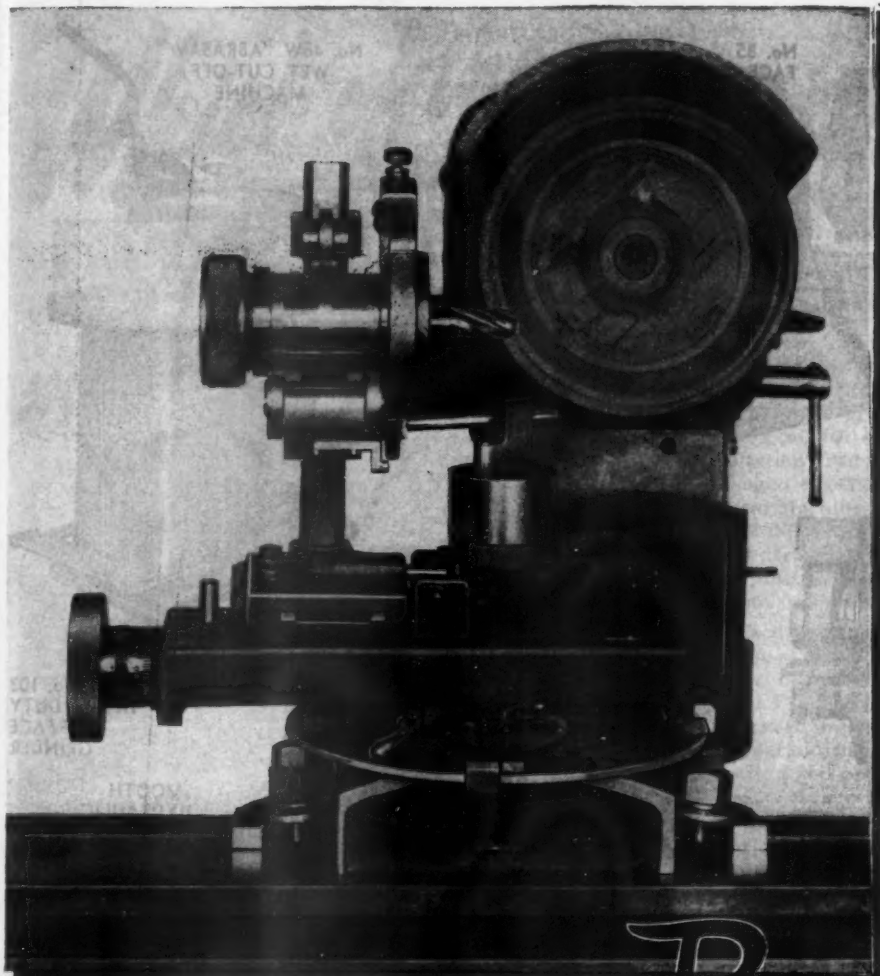

Illustrating Radiform equipped with attachments for generating precision radii on spiral fluted end mills.

MEYERS Radiform MACHINE TOOL MIRACLE

Forms Cutting Tools Directly Against Wheel Without Previous Wheel Forming

Eliminating the necessity for previous wheel forming, Meyers "RADIFORM" provides a new, practical in-your-shop method for forming various types of cutting tools.

With proper attachments, "RADIFORM" handles the most intricate tool forming operations, including precision forms on spiral fluted end mills and drills; any desired radii and clearance angles on all types of high speed steel and carbide inserted cutting tools.

Because of its versatility, accuracy and simplicity of operation, "RADIFORM" is rapidly being adopted as standard equipment in leading machine shops and manufacturing plants—saving countless man-hours, reducing costs.

Discover what "RADIFORM"—"The Machine Tool Miracle"—can do for you. Send for literature and prices.

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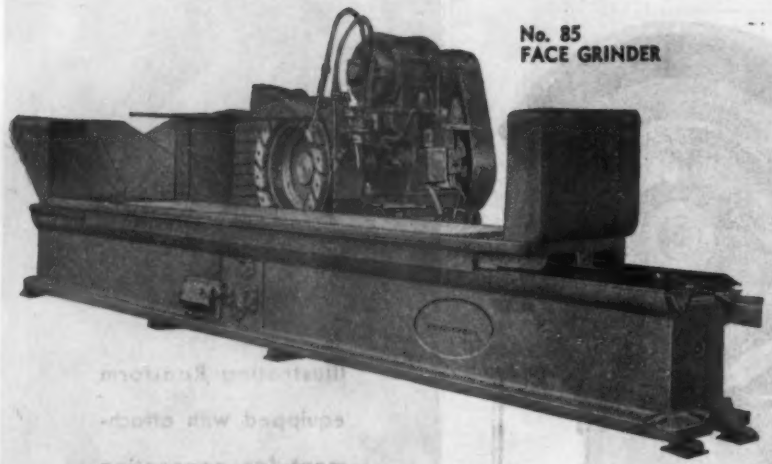

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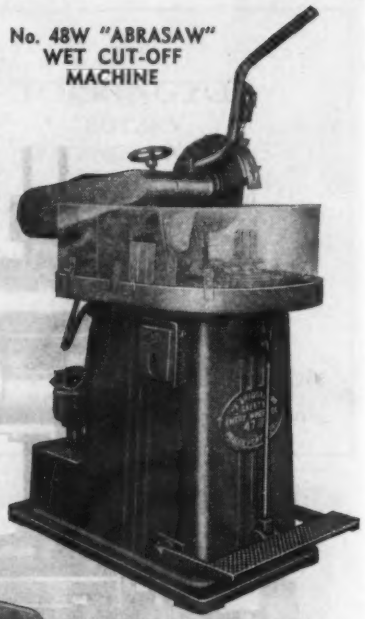

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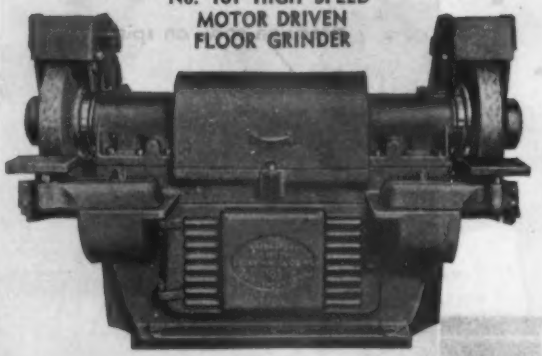

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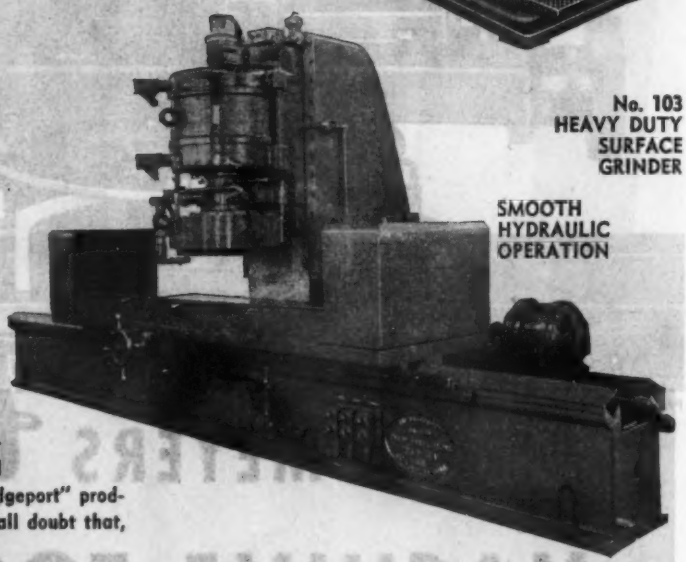

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The technique of metal removal has reached a high stage of advancement in "Bridgeport" machines and grinding wheels. Wherever speed and an accurate, well-finished surface are important, there is a "Bridgeport" product for the job. "Bridgeport" performance has demonstrated beyond all doubt that, peace or war, *there is no substitute for good equipment!*

Outstanding "Bridgeport" refinements are long-lived, smooth running bearings, an efficient cooling system, extreme rigidity of frame and fittings, and an unusually convenient location of controls and adjustments. "Bridgeport" equipment is never less than a *long-term investment.* Always glad to make helpful recommendations.

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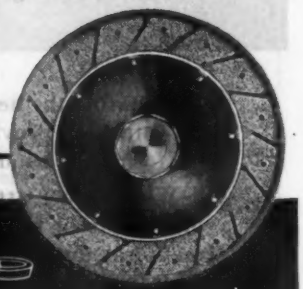

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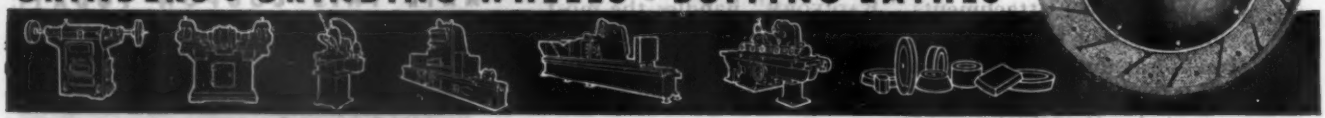

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Whatever your drilling operations, you need never look beyond the complete BARNESDRIL line to find a machine designed to produce the job at a saving.

This is true because every BARNESDRIL machine is an *engineered production unit* designed specifically to increase production and reduce costs on a particular type of drilling operation. If your operations call for single-spindle machines, make your selection from the various models of single and ganged BARNESDRIL Self-Oiling, All-Geared and Hydram Machines. For multiple-spindle work choose BARNESDRIL Progressive Production Drilling Units or Standard Hydraulic Units which can be arranged in practically any combination of vertical, horizontal or inclined positions to suit the individual job.

Each BARNESDRIL machine is available in a complete range of speeds, feeds and capacities simplifying the selection of the proper machine for any class of work from light to heaviest drilling. BARNESDRIL engineers can show you how to adapt standard machines to special drilling applications and counsel you on tooling and production problems. Send blueprints and complete data for free analysis and recommendations—there is no obligation.

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DEFENSE DEMANDS
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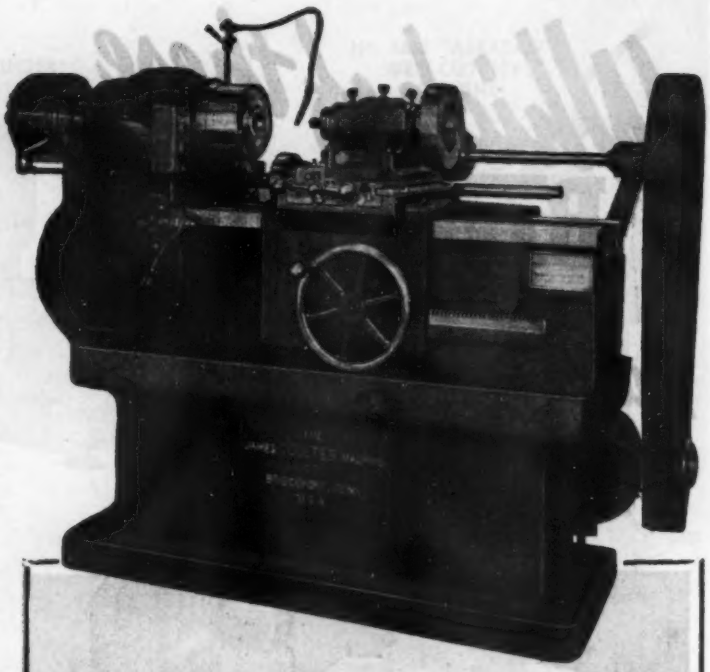
EXTERNAL and INTERNAL
THREADS



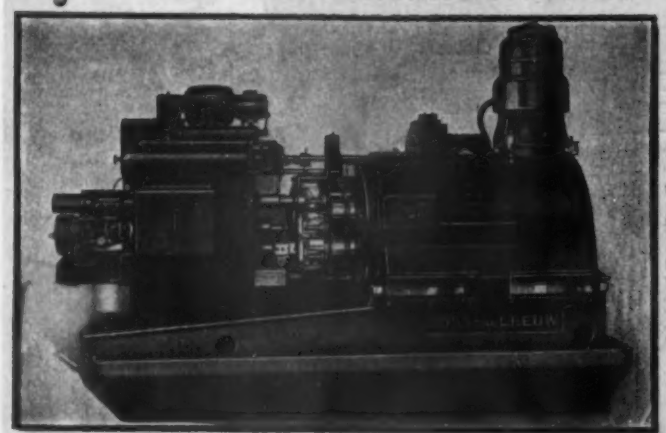
The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

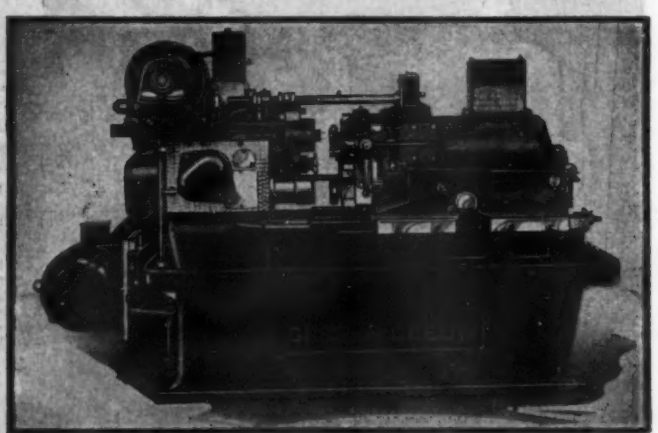
Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT · CONNECTICUT · U.S.A.





GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

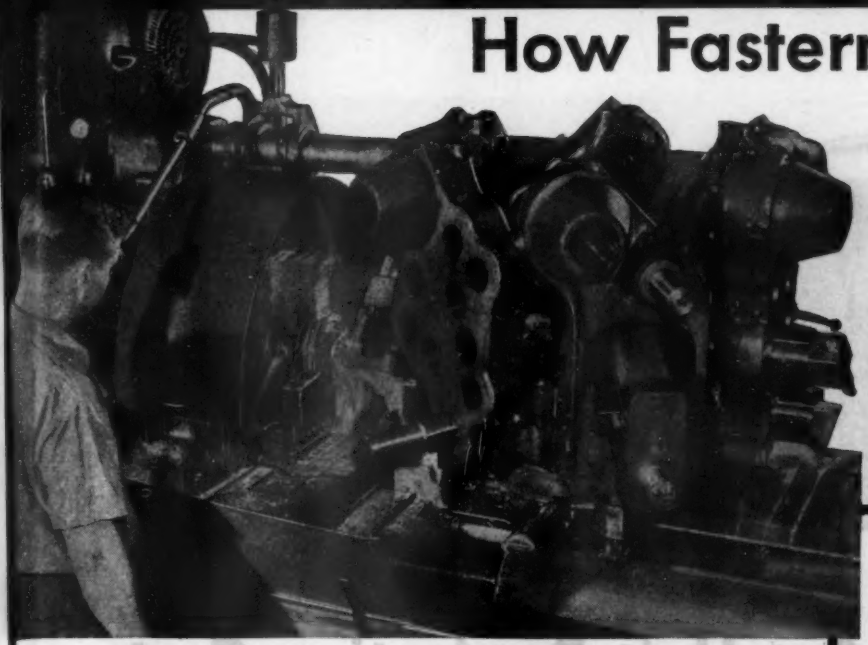
On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

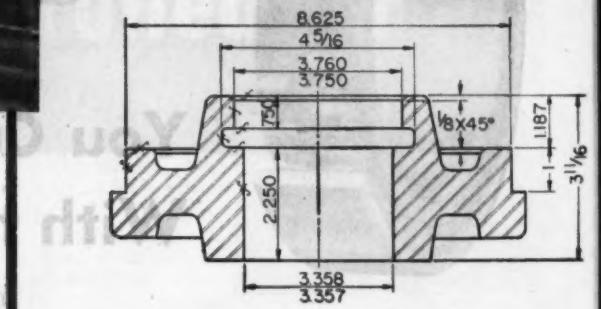
Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

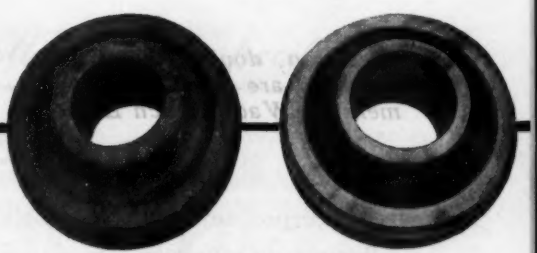
Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

How Fastermatic Automatic Turret Lathes Perform 9 operations in the time required for 7







(Above) Rough and Semi-finished Forging

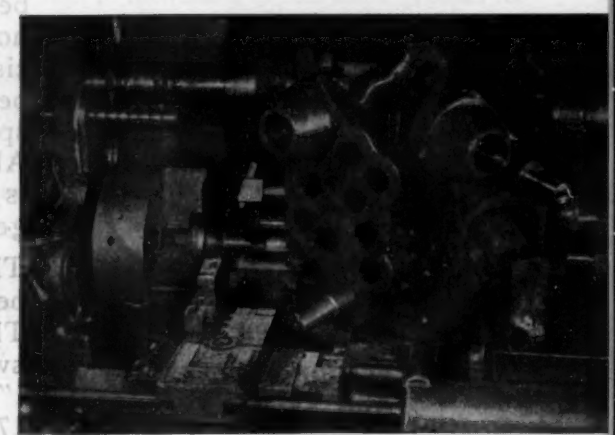
5 Feeds, 2 Speeds Automatically Changed to Give Most Efficient Operation . . .

Here is another example of how Fastermatic automatic controls reduce machining time. A large Eastern transmission manufacturer now gets a production bonus of 2 extra facing operations, in the time normally required for turning and boring alone, on this low speed gear blank by combining turning, boring and facing cuts in simultaneous cross slide and turret movements. All are automatically controlled with a Foster Fastermatic Model 4-FUT Automatic Turret Lathe.

The machine, with tool set-up as shown, handles 9 operations automatically including rough boring, turning, chamfering, counterboring, facing and finish boring. During these operations two speeds of 105 and 247 r.p.m., and five feeds of .0224", .0214", .0042", .0077" and .0091" are used, all automatically changed during the machining cycle. Total floor-to-floor time is fractionally over 7 minutes for the combined 9 operations.

Because the entire machining cycle is completely automatic—including the combined cross slide and turret operations—the operator has only to load and unload the work. Neither the speed of the machine in production nor the accuracy of the finished part is dependent upon the human element.

If you are using manually operated turret lathes for chucking work, you will find that Foster Fastermatic Automatic Turret Lathes can achieve similar production economies for you. Foster engineers will be glad to estimate the savings possible on your work without obligation.



FASTERMATIC PRODUCTION DATA

MACHINE — Fastermatic Model 4-FUT.

PART — Low speed transmission gear blank.

MATERIAL—Steel forging, S.A.E. 4620.

HOLDING METHOD — Three-jaw chuck, special jaws.

SPEEDS—Positions 1, 2 & 5.. 105 r.p.m.
Position 6..... 247 r.p.m.

FEEDS—1st Position..... .0224"
2nd Position..... .0214"
3rd Position (skipped)
4th Position..... .0042"
5th Position..... .0077"
6th Position..... .0091"

PRODUCTION—7 minutes, 5 seconds per piece, floor-to-floor time.

Get the Facts...FREE!

Learn how Fastermatics can help you solve production problems like this. Write for your free copy of this new Fastermatic catalog complete with facts and data every production man needs about these high-production machines. Address Foster Division, 1110 Beardsley Ave., Elkhart, Ind.

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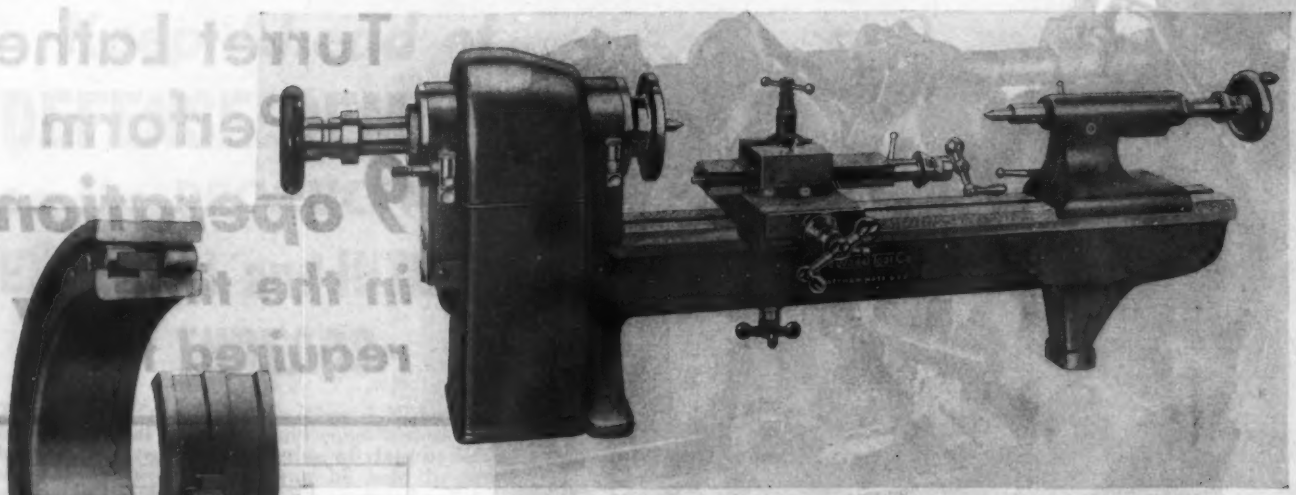
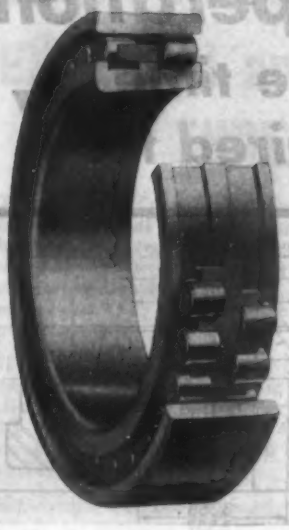
FOSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS • SUPERFINISHING MACHINES • SPECIAL MACHINE TOOLS





Precision double-row roller bearings are standard equipment on Wade Bench Lathes.

You Cut Unit Production Costs With the Wade Standard Lathe

You cut unit production costs . . . save time and money . . . when you use Wade Standard Precision Lathes . . . because they are designed and built with features that permit faster, lower-cost operation. Wade Lathes enable you to do more work in less time.

Greater savings are made with Wade Standard Lathes because of their scientific design. The spindle stays rigid, for it runs in high precision anti-friction bearings. A staggered double-row cylindrical roller bearing supports the spindle as close to the spindle nose as possible and takes the radial load. A precision ball thrust bearing, just back of the roller bearing, takes the thrust load. The rear end of the spindle is supported in a deep groove ball bearing. All bearings are under a slight preload so the spindle is absolutely rigid. You can take heavier cuts and get better finishes . . . without chattering.

These Wade Standard Lathes are efficient and dependable for time-saving, money-saving production. They are available in three sizes, all with a 7" swing. Maximum collet capacities are ½", ¾" and 1" and distance between centers is from 15½" to 17". To do better precision work . . . to cut unit production costs and save time and money . . . investigate these Wade Lathes now.

Write today for catalog

Wade

Bench Lathes and Profilers
For Precision, Versatility
And Stamina

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

Follansbee cold rolled strip

Precision rolled to your specifications

If you need Cold Rolled Strip Steel in thin gauges, Follansbee merits your consideration as a source for your supplies.

Follansbee brings to the rolling of this staple product its many years of experience as a maker of high quality steels and steel specialties. This means that you can rely on Follansbee to furnish you with Strip that meets your most exacting requirements in Temper, Gauge, Width and Camber.

In addition, Follansbee offers the special attention and services which only the flexibility of a compact organization can provide.

On your next order for Cold Rolled Strip—or other steels—it will pay you to check with Follansbee.

FOLLANSBEE STEEL CORPORATION

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ALLOY BLOOMS & BILLETS, SHEETS & STRIP • • • COLD ROLLED CARBON SHEETS & STRIP
POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

Bridgeport

TURRET MILLING MACHINE

MILLS, DRILLS, BORES and SHAPES AT ALL ANGLES WITHOUT CHANGING SET UP

This universal machine is many machines in one. Its versatility and scope of operations are without parallel. Equipped with the universally used "Bridgeport" Milling Attachment, milling, drilling and boring at all angles can be handled at a single set up and with utmost precision.

While furnished as standard equipment on the Bridgeport Turret Milling Machine, the Bridgeport High Speed Milling Attachment can be mounted on any type of milling machine as well as special production equipment.

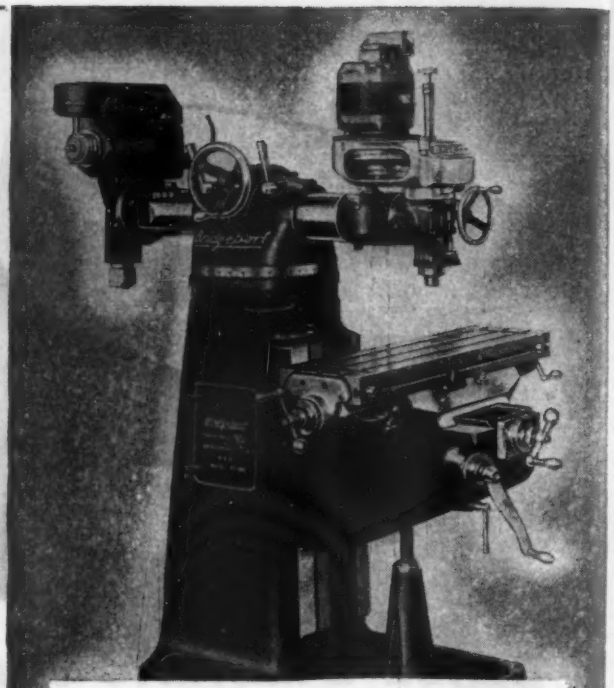
. . . and NOW A SHAPING ATTACHMENT

Tremendous demand for Bridgeport Machines has delayed until now the production of this much needed Shaping Attachment. It is now available not only to owners of Bridgeport Turret Milling Machines but also to machines of other manufacturers.

The Bridgeport Shaping Attachment (mounted on back end of overarm) provides the means for shaping and slotting at all angles and on a wide variety of work such as dies, mold work and intricate production jobs. It is of sturdy construction and convenient to use.

Write for Illustrated Bulletins giving complete details

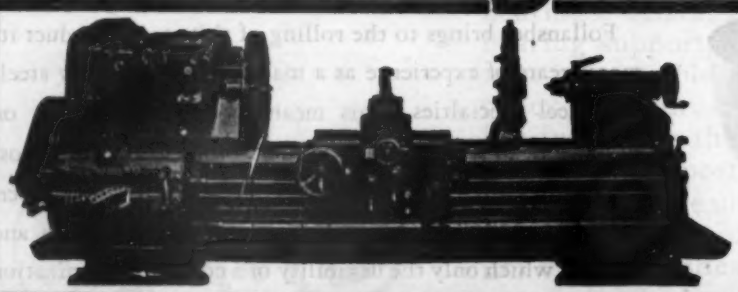
THE BRIDGEPORT MACHINES, Inc., Bridgeport, Conn.



Specifications

MACHINE	MILLING ATTACHMENT
Longitudinal Feed—20" Cross Feed—9" Vertical Feed of Knee—16" Spindle to Table—17" Table—9" x 32"	Spindle Speeds, 275, 425, 700, 1050, 2100, 4250 Quill Travel—3½" No. 2 Morse or No. 7 B&S taper spindle ½ HP Motor

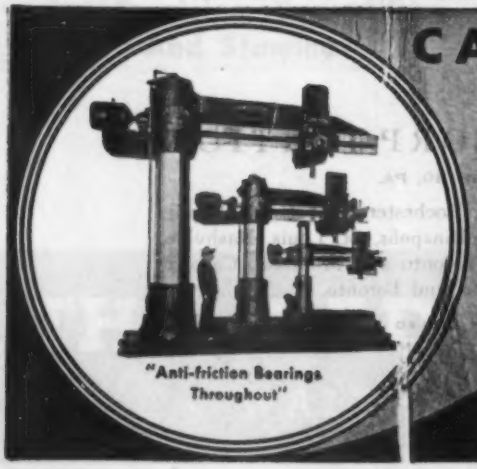
SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO U.S.A.



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**

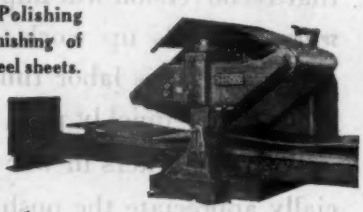
MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

MATTISON
ABRASIVE BELT GRINDING AND POLISHING MACHINES

Mattison W-455 Wide Belt Grinding and Polishing Machine for finishing of wide stainless steel sheets.



Mattison S-441 Grinding and Polishing Machine for flat and curved work. Can be furnished with or without special fixtures, depending on work ground.

Mattison J-400 Backstand Idler adapts regular polishing Jack to the use of factory-coated abrasive belts.

Mattison H-424 Internal Tube Grinding and Polishing Machine for finishing inside of metal tubes.

Mattison L-138 Grinding and Polishing Machine arranged for wet grinding.

★ Results obtained in a number of plants definitely establish the use of factory coated abrasive belts as a most efficient practice. Besides reducing the number of rejections and improving the finish, they have cut the polishing cost per piece through increased production.

However, to secure full benefit from factory-coated abrasive belts, the right type of mechanical unit is necessary. The machine is all important for properly applying the abrasive to the particular job to be done.

Mattison Abrasive Belt Grinding and Polishing Machines are engineered with a knowledge of the factors involved to give the best application of belts. From the time factory-coated abrasive belts were introduced for metal grinding and polishing, Mattison's have developed and built machines to provide best results.

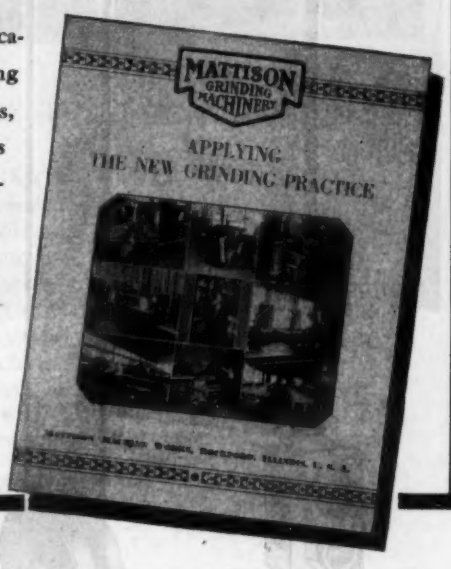
Mattison Abrasive Belt Grinding and Polishing Machines are used for smoothing up welding marks, polishing solid parts—such as handwheels, levers, handles, steel sheets including stainless steel—and the inside of tubes. They are built for both the wet and dry grinding method. In addition to the finishing of metal parts, they are used for plastics, hardened rubber, fibre, glass, etc. In fact, the applications are so numerous, only a few can be mentioned and shown on this page.

MATTISON GRINDING MACHINERY

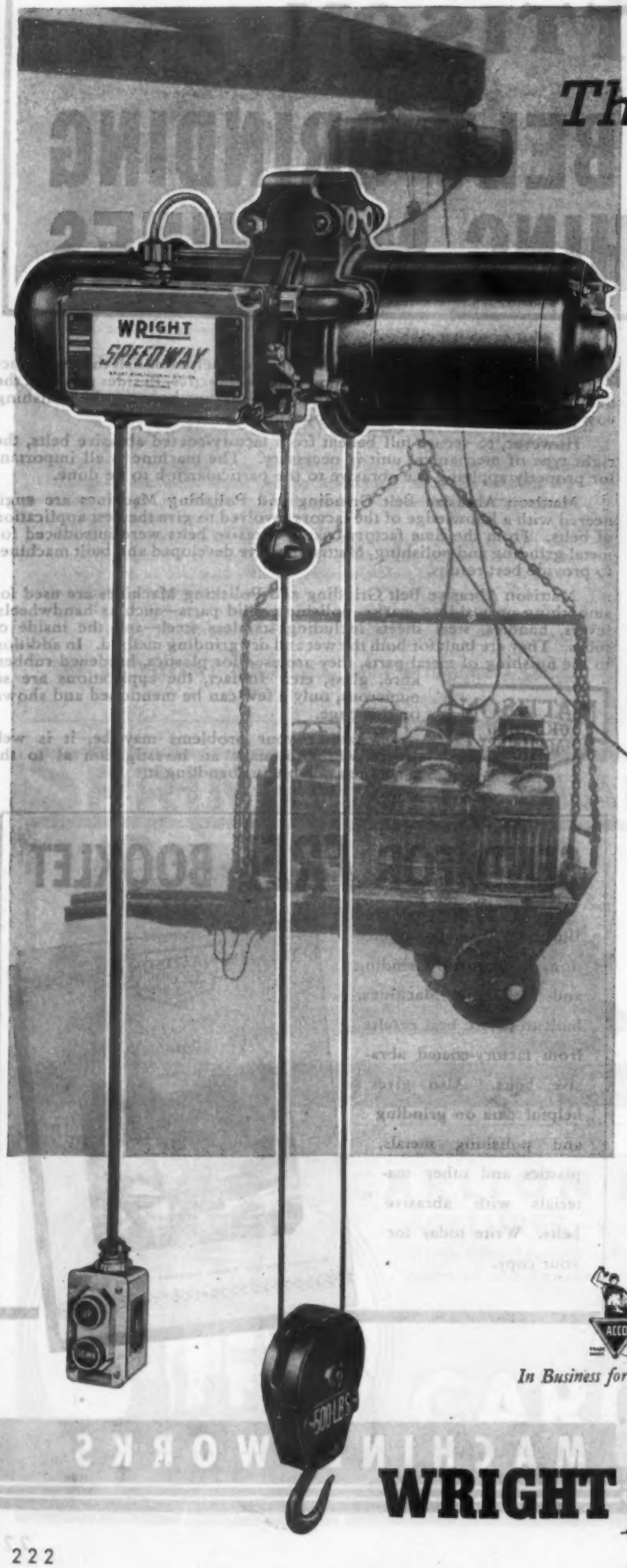
Whatever your problems may be, it is well worth while to make an investigation as to the machine available for handling it.

SEND FOR *FREE* BOOKLET

Illustrates various applications of Mattison Grinding and Polishing Machines, built to secure best results from factory-coated abrasive belts. Also gives helpful data on grinding and polishing metals, plastics and other materials with abrasive belts. Write today for your copy.



MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS



The *SPEEDWAY* is **WRIGHT**

Get an Improved **WRIGHT** *SPEEDWAY* Electric Hoist as soon as possible—both for now and the hurried production demands that reconversion will impose. **WRIGHT'S** *SPEEDWAY* speeds up work, makes jobs easier. It saves labor time, cuts handling costs—quickly pays for itself.

Women workers in war plants especially appreciate the push-button ease with which the **WRIGHT** *SPEEDWAY* is operated. The *SPEEDWAY* helps them maintain their morning vigor throughout the afternoon.

The *SPEEDWAY* Electric is a sturdy, lightweight, wire rope hoist, designed for fast lifting on assembly floors and for general use. Designed with spur gear construction, magnetic control and mechanical features found only in the more expensive production-type hoists. Yet it is priced economically low.

Talk to your **WRIGHT** distributor about *SPEEDWAY'S* advantages. He is listed in your classified telephone directory.

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, Denver, Los Angeles,
New York, Portland, San Francisco

AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT · CONNECTICUT

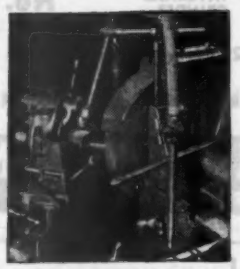
In Business for Your Safety

ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

WRIGHT *SPEEDWAY* HOISTS

The First Point and the 10,000th will be SCIENTIFICALLY CORRECT!

SELLERS NO. 1-G DRILL GRINDER with cabinet. Grinds either straight or tapered shanks in sizes from .028" to ½" dia.



SELLERS NO. 4-T TOOL GRINDER. A fully universal grinder for single point tools of every shape—from ¼" sq. to 1½" x 2".

IF fast, accurate drilling is important to your production you will find the answer in a

SELLERS DRILL GRINDER

It's more than a machine. It's a *method* of grinding which automatically produces the scientifically correct drill point required for precision work. Angles of inclination are equal, contour of lips is identical, resulting in a point which drills true cylindrical holes faster and more holes per grind. Inexperienced girls are quickly trained to turn out a continuous supply of perfect drill points—reducing both your drill inventory and drilling costs. Sellers Drill Grinders are made in 3 sizes to accommodate drills from .028" up to 3". Shipped complete, ready to plug in and go to work!

• • •

For proof of why it will pay you to equip your tool room with this modern machine, send us three drills of any size up to 3 ins. and we will return them ground with the Sellers point. No charge, no obligation.

Wm. Sellers & Company, 1610 Hamilton St., Philadelphia

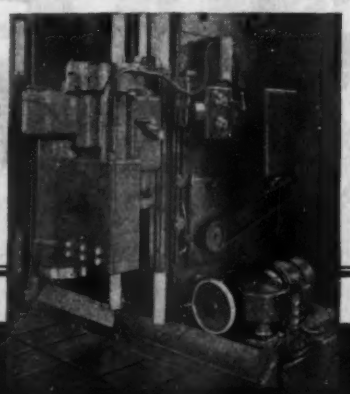
SELLERS PRECISION MACHINE TOOLS SINCE 1848

Bores Connecting Rods of Many Lengths

Both ends of large Diesel engine connecting rods are trepanned and bored by this special MOLINE No. HF144, two-column boring machine. Holes up to 12 inches in diameter on 20 to 60-inch centers can be handled because the right hand column is mounted on a heavy slide which is traversed by electric motor on a horizontal V-guide and flat way. The column is clamped in position on the ways or moved for close adjustment by means of handwheels. A hardened and ground plate on each spindle head permits the use of spacing rods for adjustment of centers.

Electrically controlled, hydraulic feed moves the spindle heads on vertical, double V-guides at rates from .125 to .9 inches per minute. Any spindle speed from 5.66 to 236 R.P.M. can be obtained through quick change gears and 3 to 1 speed range spindle drive motors.

If you have a problem in drilling, boring, honing, milling, tapping or reaming, submit it to MOLINE.



Right: Close-up of spindle head showing spindle speed rheostat and push buttons for motor control.

DESIGNERS and BUILDERS of SPECIAL MACHINERY since 1901. "HOLE HOG" Drilling, Boring, Honing and Tapping Machines.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

These small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
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ABRASIVE
ACCURACY BOOSTS PRODUCTION

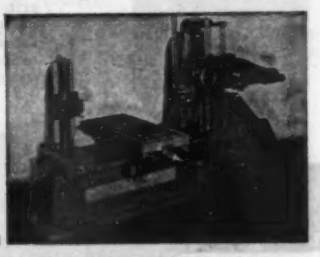
No. 1G	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	**No. 3B**	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.

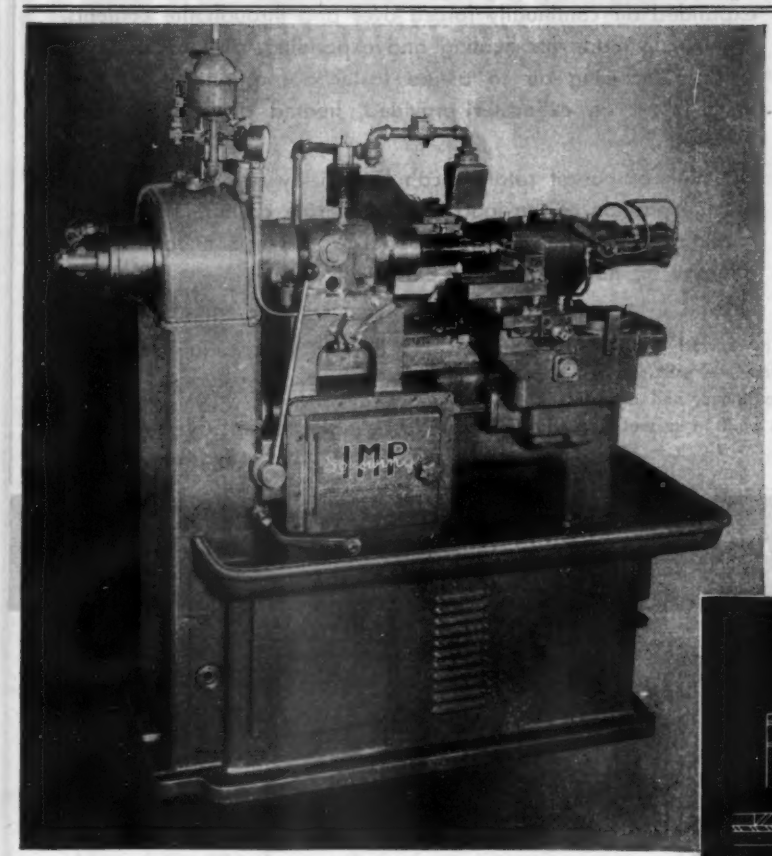


Standard Universal 3" Spindle Machine

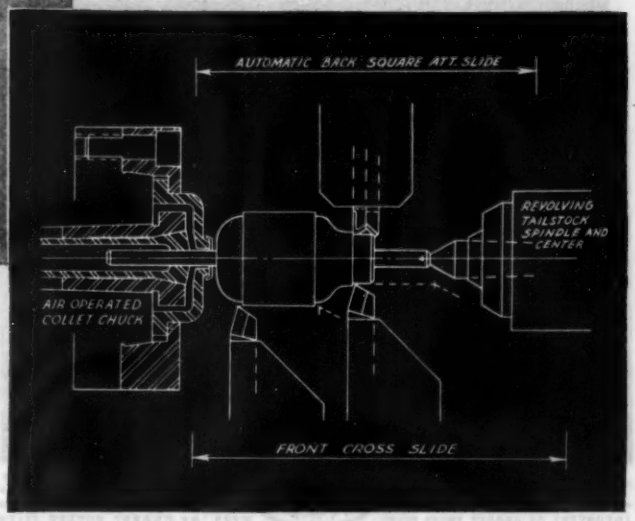
UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



ROTOR AND STARTER COMMUTATORS *Automatically* MACHINED TO HIGH ACCURACY AND FINISH ON *Lo-swing* IMP



PROBLEM: To automatically turn, chamfer and face electric motor rotor and starter commutators, maintaining a fine finish and extremely close tolerances.

SOLUTION: The Lo-swing IMP Lathe with special equipment was selected for this job primarily because of inherent design features which permit high spindle speeds and unusual turning accuracy.

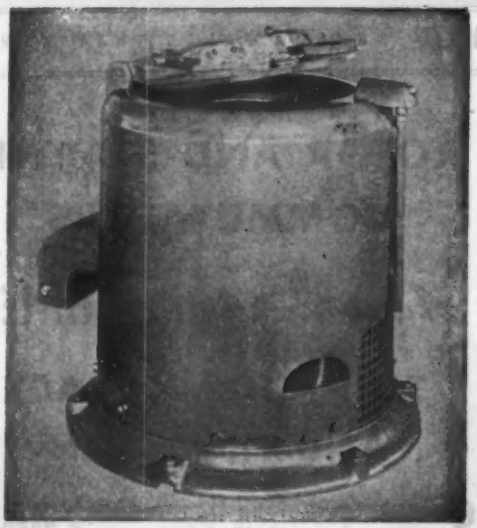
The work is held and driven from one of the ball-bearing seats of the shaft with an air-operated collet chuck. The tailstock end is supported on a revolving center, the movement of which is actuated by an air cylinder. This method of holding and driving the rotor assures the close concentricity which is required between the bearing seats and the O. D. of the commutator. The operation consists of turning the O. D. of the commutator and rotor, the facing of the shoulder (which is part of the commutator) and the chamfering of the shoulder.

Several other Lo-swing set-ups have been developed for this type of work. We suggest you send in your prints for our estimate.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS *from* SENECA FALLS

DRY SMALL PARTS QUICKLY and ECONOMICALLY with BARRETT CYCLONE CENTRIFUGAL DRYERS



The Barrett Centrifugal Dryer — efficient, self-contained, and compact is built in several sizes.

• The Barrett Parts Drying Process centers around a method of creating a guarded cyclone.

In operation, parts to be dried are placed in a well ventilated motor driven rotating basket. Free liquid is immediately thrown off by centrifugal force and any moisture remaining on parts is absorbed in the shortest possible time by the large volume of expanded air continually forced over and through the contents. Provision is made for heating and expanding, also boosting the flow of incoming air to assure faster absorption of moisture. With the large exhauster provided, heated air is not always required.

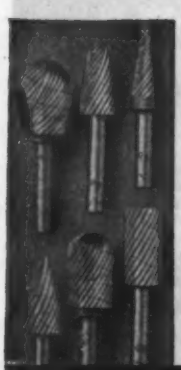
Direction of basket rotation can be quickly reversed which will change position of the load and accelerate drying. Baskets are available in shapes which experience has shown to be most effective for handling various classes of work.

It will pay to investigate the advantages offered by Barrett Centrifugal Dryers on your work.

Full Details of the Barrett Cyclone Dryer Sent Promptly on Request.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery



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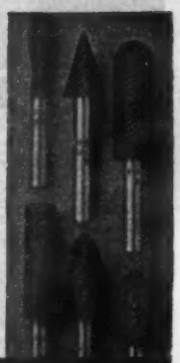
Hand Cut • Milled Cut Ground from the Solid

There is a GROBET ROTARY FILE in shape, size and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. GROBET FILES do their jobs better and stay sharp longer.

Send for catalog DR, the most complete of its kind illustrating and describing GROBET Rotary Files, Diesinkers, Burs, Tube Burring Cutters, Chatterless, Countersink, etc.



GROBET FILE CO. of AMERICA

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IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

Plants: New York • Chicago • Los Angeles

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
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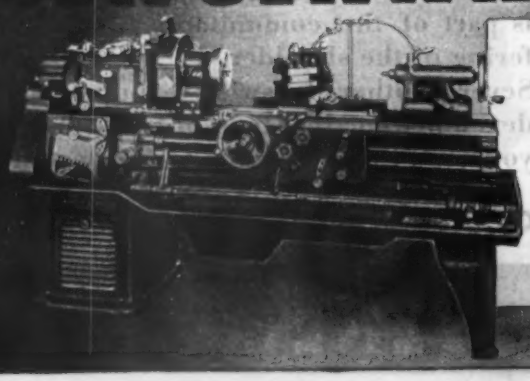
LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS-CRANK SHAFTS

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

CINCINNATI LATHES



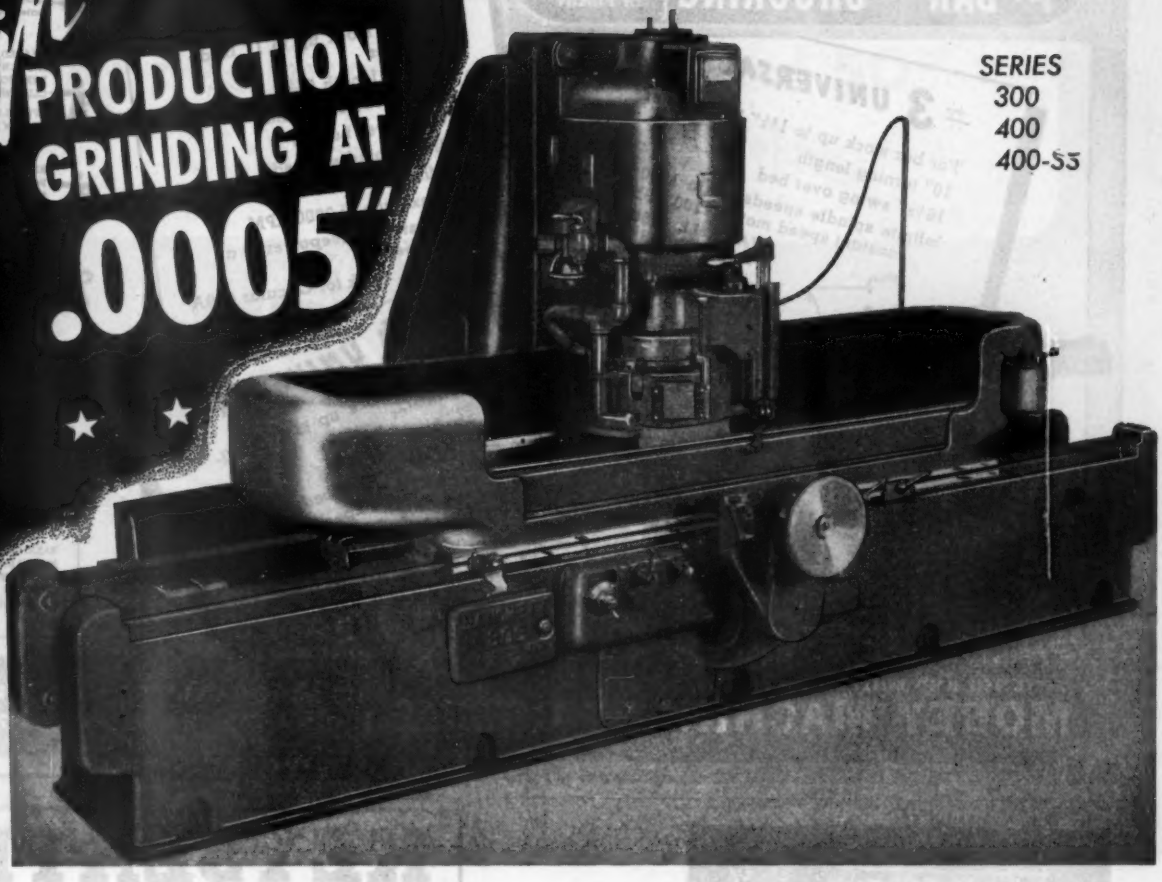
CINCINNATI LATHES PROVIDE A WIDE VARIETY OF SET-UPS

All the inherent advantages of Cincinnati Lathes—speed, sturdiness, convenience and accuracy—are available on a wide range of work because of the tooling possibilities of these modern cost-cutting machines. Send us your blueprints and specifications requesting our engineers for tooling suggestions. Send for catalog covering sizes in which you are mostly interested. Produced 14 to 30 inch inclusive.

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

High PRODUCTION GRINDING AT .0005"



— That's regular performance on this Hanchett Surface Grinder. On special work, this vertical spindle, reciprocating table machine grinds to limits of .0002".

FLEXIBILITY for grinding a wide variety of work such as: Machine Parts — Wrenches — Shear Blades — Die Blanks — Gear Racks — Cutter Blanks — Small Tools — Long or Narrow Pieces.

IN 3 SIZES

Series	Wheel Motor	Grinding Wheel Diameter	Work Table Width	Work Table Length
300	25 hp.	14"	13"	36" to 72"
400	40 hp.	22"	18"	50" to 220"
400-SS	60 hp.	32"	28"	60" to 220"

FEATURES: Table speeds up to 90 f. p. m. Convenient controls. Universal adjustment for grinding Wheel Head. Forced feed lubrication. Efficient coolant system. Special switch to completely demagnetize chuck. Automatic sizing device to stop down-feed when work is to size. Visual ammeter on grinding wheel motor to check wheel performance.

Get the full story of the Series 300, 400, 400-SS

Write for Bulletin 170A-14

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.

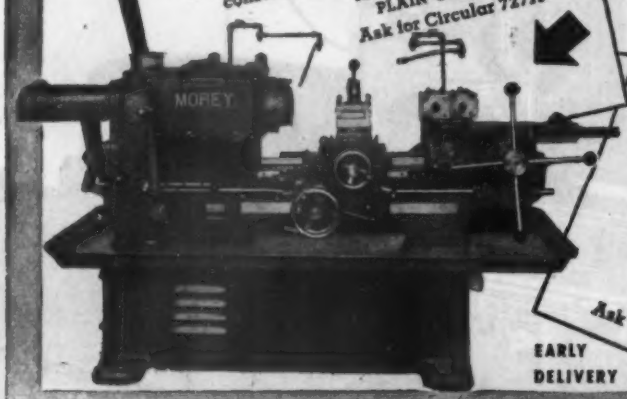
BIG RAPIDS, MICHIGAN U.S.A.

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A



EARLY DELIVERY

INFINITE SPINDLE SPEEDS —Electrically Selected—

DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).

GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.

SPINDLE MOUNTED ON TIMKEN BEARINGS.

RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.

SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

FIDELITY
Screw-Type Wire Spooling Machine...

For low wire speed . . . and fine wire from .002" to .010" diameter. Spools loaded or taken off while machine is in operation. The machine illustrated, six individual spooling heads and adjustable traverse, is equipped with speed reducer and variable speed drive to vary wire speeds from 40 to 120 feet per minute.

Other FIDELITY Machines for winding plastic tapes, surgical threads, fine filament wires, etc., frequently combine additional functions like inserting the wound package into a container.

BUY BONDS to bring the boys down the Home Stretch

33 YEARS' EXPERIENCE

Intricate, Automatic Precision Machines

FIDELITY MACHINE COMPANY
3908-18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

Annealing costs reduced 50% with electronic heating

G-E electronic tubes supply the high-frequency power for this industrial heating application.

Electronic heating makes it possible to localize heat where you want it . . . both the heated area and the depth of the heat-affected zone can be controlled within close limits.

One large manufacturing company uses the feature of localized heating with a G-E electronic heater to anneal the ⅛-inch tip of small thumbscrews while the rest of the screw remains hardened to the far end of the thread. By conventional heating methods, it was difficult to confine the heat to the tip. Costs were high. Now, with a single electronic heater, 100,000 thumbscrews are annealed per day—at one-half former cost and with exceptional uniformity of product.

Two G-E electronic tubes—the GL-851 power-oscillator triode and the FG-104 rectifier—supply the high-frequency waves for this heating application.

Electronic heating is divided into two broad classes. Induction heating can be used in the treatment of metals to harden, anneal, braze, and solder. Dielectric heating can be used for heating non-conductive materials such as plastics.

Electronic heating eliminates waste heat, cuts heating time-lag, minimizes scale, improves working conditions. It does many heat-treating jobs faster, better, and in most cases at lower cost.

To designers, manufacturers, and users of electronic-heating equipment, General Electric offers a complete line of electronic tubes for all applications. Through its nation-wide distributing system, General Electric is prepared to supply users of electronic devices with replacement tubes.

For information on electronic tubes for all applications, write *Electronics Department, General Electric, Schenectady 5, New York.*

Tune in General Electric's "The World Today" and hear the news from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS network. On Sunday evening listen to the G-E "All Girl Orchestra" at 10 E.W.T. over NBC.

G. E. HAS MADE MORE BASIC ELECTRONIC-TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

163 C13-6880

. . . for better finishing at lower cost

THE "PRODUCTION" NO. 101 CENTERLESS FEED POLISHING MACHINE

Work may be fed through this machine with inexperienced labor and a superior finish assured at fastest feeds. Work is fed automatically, no centering, chucking or holding being required.

The "No. 101" is ideal for cylindrical work, such as tubes, rods, bars, etc. Has capacity for polishing cylindrical work from 1/8" to 6". Wheel can be trued with machine in operation.

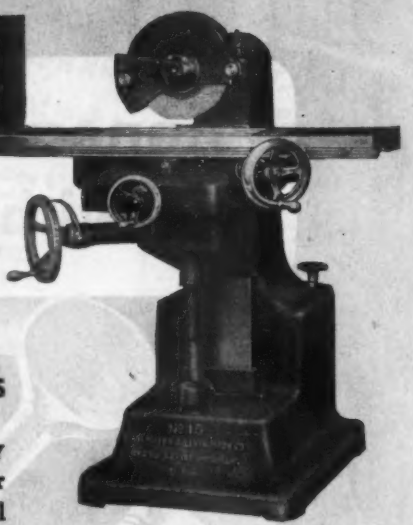
Write for illustrated folder giving complete details.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

GRAND RAPIDS



No. 15 Motor Driven Surface Grinder
HAND FEED

•

FOR SMALL DELICATE JOBS

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel

Reasonably Prompt Delivery

Many manufacturers on war work are using large batteries of these grinders.

CATALOG ON REQUEST

GALLMEYER & LIVINGSTON CO.
330 Straight Ave. S. W.
GRAND RAPIDS 4 **MICHIGAN**

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

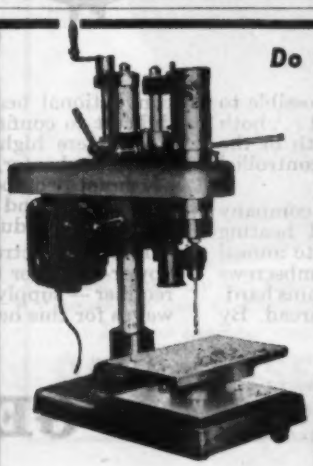
THE PORTAGE MACHINE CO.
AKRON 11, OHIO

ROCKFORD MACHINE TOOL CO.

Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers
— ROCKFORD, ILLINOIS, U. S. A. —

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. **Cincinnati, Ohio**



Do your sensitive drilling on a

MAXI-JR-E

• Here is a high production unit for small holes from .004" to .250" diameter. Sturdy — smooth — fast —it is a self contained unit with 8 inch vertical adjustment on column. Drilling unit overhang from center of chuck to column 5". Vertical capacity 10". Available in spindle speeds from 750 to 12,000 r.p.m. Write for bulletin.

The Hamilton Tool Co.
HAMILTON OHIO

Now Available FOR MANUFACTURERS

HECOMATIC

INFEED and CHUCKING Attachments for Profile Grinding on No. 2 Centerless Grinders

What HECOMATIC Is

Hecomatic consists of three light, compact units . . . the magazine . . . the power unit . . . and the electric Solenoid Ejector. Hecomatic mechanically does *all* the operations which man would do in *hand feeding, grinding and ejecting.* Hecomatic reduces the labor to such an extent that a girl can effortlessly operate the grinder, gauge for size, and still substantially *increase production.*

Hecomatic is the Heckethorn answer to the problem of automatically feeding, chucking and ejecting profile work on a No. 2 Centerless Grinder

Slight alterations will permit Hecomatic Attachments to function on almost any type profile grinding job, giving uniform quality of work with definite increase in production.

How HECOMATIC Works

A plunger-fed magazine is used to position one part at a time on the work rest. A cam-operated arm serves to move the table at the proper speed for fast removal of from .006 to .008 of stock on a piece up to approximately 1" in diameter, using a 60-grit wheel with the machine cycling at the rate of 900 pieces per hour. More stock could be removed in the same time by using a coarser grit wheel. As the arm withdraws the table, a cam-operated limit switch energizes a Solenoid ejector and the cycle repeats. A large portion of the cycle is used for grinding; only a small portion for loading and ejecting. Thus, production may be increased 50% and more, and the quality maintained.

HECOMATIC *Engineering Service*

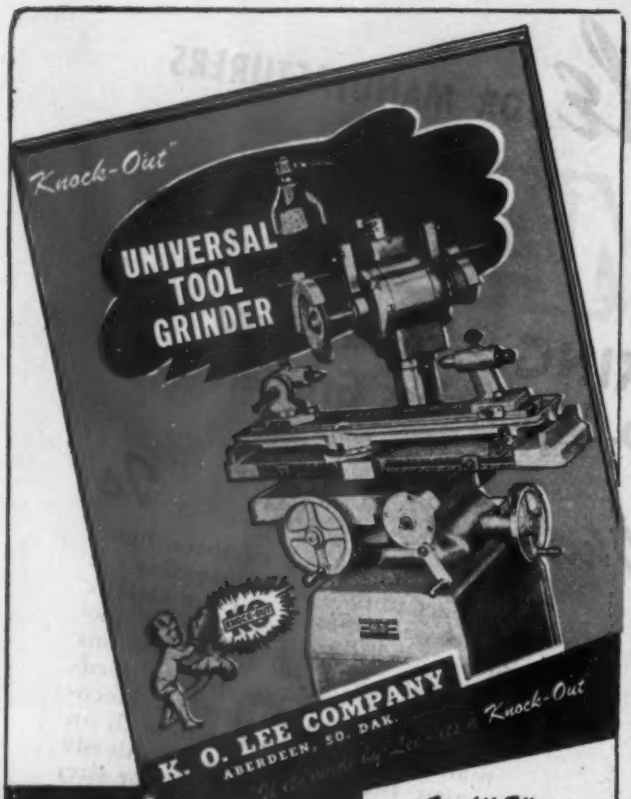
HECO Engineering Department will be pleased to receive your inquiries regarding the Hecomatic method as applied to your profile grinding job.

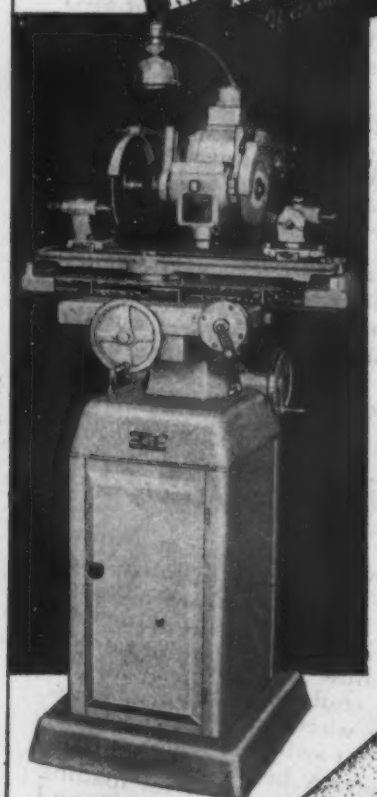
Please address Dept. *A.M.*

HECO TESTED AND PROVEN PRODUCTS

HECKETHORN MFG. & SUPPLY CO.

Littleton, Colorado, U. S. A.





You'll Want This New Tool Grinding Book!

Illustrative literature just off the press is now available for the asking. Fifty-two operating pictures, latest improvements in tool grinders. Many time saving grinding fixtures that are adaptable to any make tool grinder.

Detach, fill out and send in coupon today.

Model B600
Knock-Out
UNIVERSAL TOOL GRINDER
NINE OPERATING SPEEDS
1,100 to 11,000 R.P.M.

K. O. LEE CO.,
Aberdeen, S. D.

Gentlemen:
Please send me by return mail, and without obligation, your new booklet No. 27-124

Name_____
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Name of Company_____

LM

REID All Electric Automatic Feed Surface Grinder No. 2B

Equipped with Motorized Spindle

Write us today for your nearest dealer's name and address.

A Proven Product for Over a Quarter Century with Thousands in Use Daily

Send for Descriptive Literature
EXCELLENT DELIVERIES

Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OR ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

LUCAS "PRECISION"
Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

MILLHOLLAND

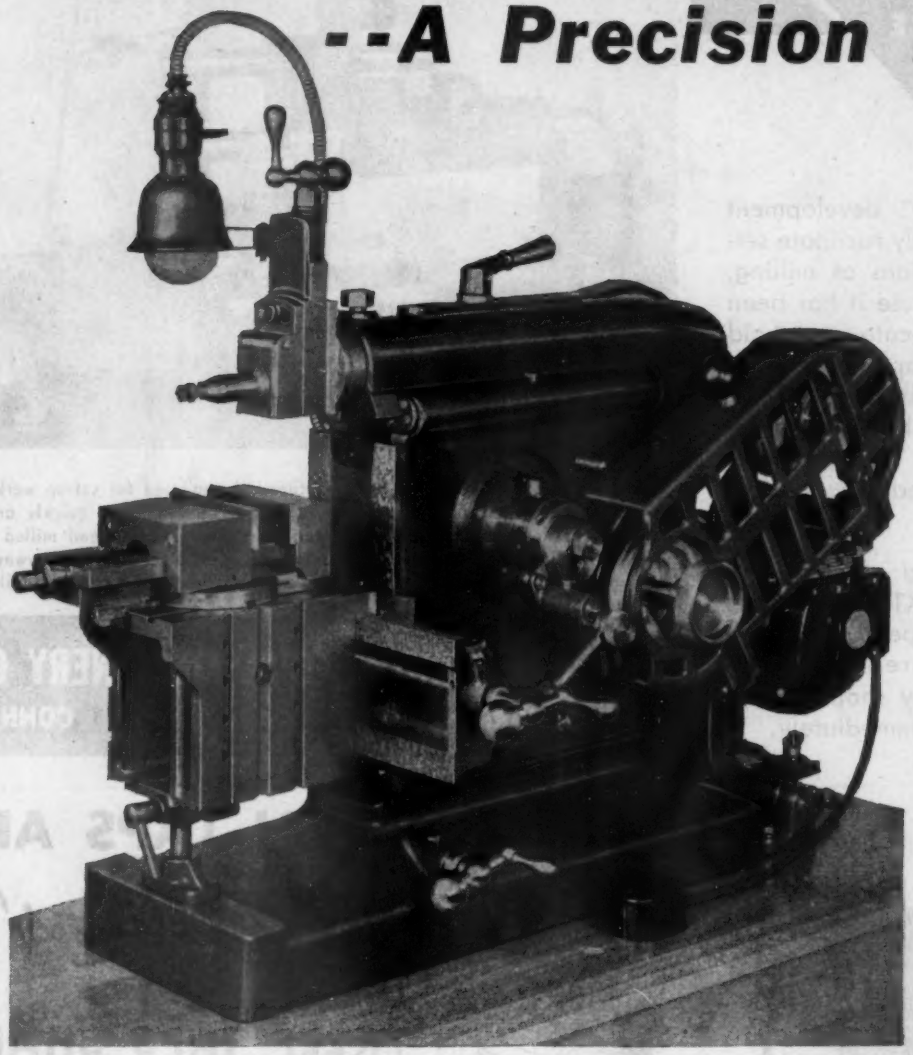
Automatic DRILLING - BORING MILLING - TAPPING Units

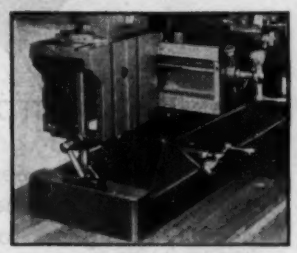
½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

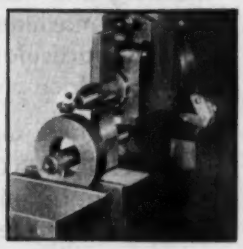
W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

AMMCO 7" SHAPER
--A Precision Machine

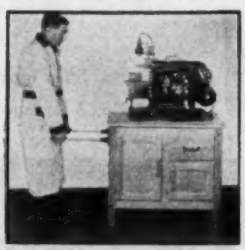




★ Has "VEE" Type Ways, comparable to those of large, expensive shapers.



★ Handles a wide variety of work.



★ Portable Model is mounted on maple cabinet.

You'll be amazed and agreeably pleased with the precision, speed and economy with which you can turn out jobs on an AMMCO SHAPER . . . Users tell us "it's the finest made."

It is small in size, but it is mighty in efficiency and precision.

On jobs requiring a stroke of 7" or less, the AMMCO 7" SHAPER will enable you to save a lot of time and expense on a set-up such as would be required on larger shapers . . . You also have an opportunity to effect considerable savings in capital investment . . . savings in electrical power consumption and savings in floor space . . . Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work, and will leave big shapers open for big jobs.

Construction incorporates many features you would expect to find only in larger, more expensive machines . . . For example: WAYS of ram, tool head, and front face of the main frame are of the "VEE" type, hand scraped to insure accuracy and long life . . . Available for bench installation, or as a portable unit.

Write today for specifications and prices

ARMY E NAVY

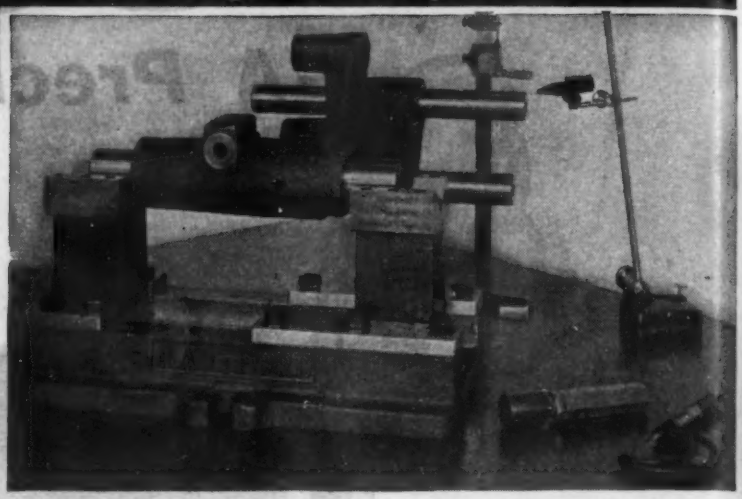
AMMCO 2100 COMMONWEALTH AVENUE
NORTH CHICAGO, ILLINOIS

The HARTFORD V-BLOCK FIXTURE

. . . speeds set-up and inspection of irregular shaped work

This recent "HARTFORD" development makes it possible to greatly facilitate setting up for such operations as milling, boring and drilling because it has been specially designed to locate and hold work having irregular shapes. The facilities provided can also be applied for checking and inspection because its accurately machined and scraped steel base is particularly suited for application on surface plates.

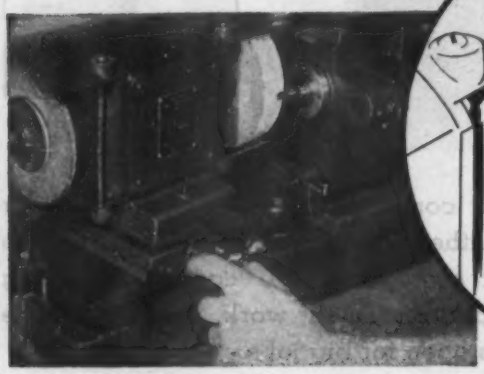
Because of its wide field of utility the HARTFORD V-BLOCK FIXTURE provides many opportunities to speed up tough set-ups and thereby assure high returns on the investment in any shop. It will pay you to investigate immediately.

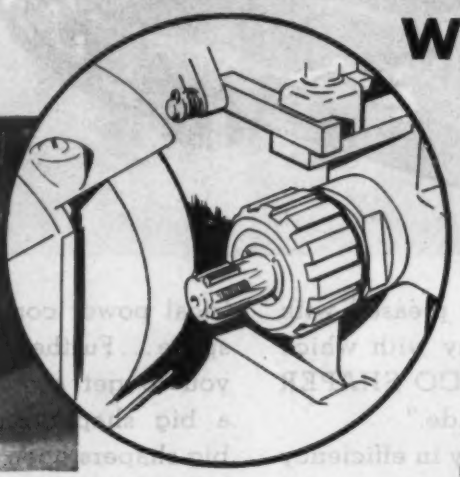


Shown here the HARTFORD V-Block Fixture is being used for set-up work on a surface plate. After machining, the irregular casting may be quickly and accurately checked for parallelism of bored holes, hole spacing and milled faces. Clamps hold work in place in accurately ground V-blocks. Cross keyways and clamping facilities provide the means for securing the fixture to work table.

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD CONN.

Model No. 1 for taps up to 6" long.
Model No. 2 for taps up to 14" long.





WORN TAPS ARE *"Quislings"*

KEEP TAPS SHARP ON A BLAKE TAP GRINDER

"Quislings" have no place in American manufacturing plants. Dull taps are "Quislings"—and there is one sure way to eliminate the delay and waste which they cause—sharpen taps on the Blake Tap Grinder. This is the best and most economical way to keep taps at top efficiency. The Blake method keeps taps at "original" sharpness, prevents broken taps, prevents spoiled work, reduces power consumption. Both the Model No. 1 and No. 2 will sharpen taps with 2, 3, 4, 5, 6, 8 and 10 flutes, both right- and left-hand. It will pay to get the full information in Bulletin 544—mail the coupon today.

No machine is better than the cutting edge of the tool it uses.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS - WALTHAM CUTTER SHARPENERS

Please send me Bulletin 544 which gives complete details on Blake Tap Grinders

A.M.

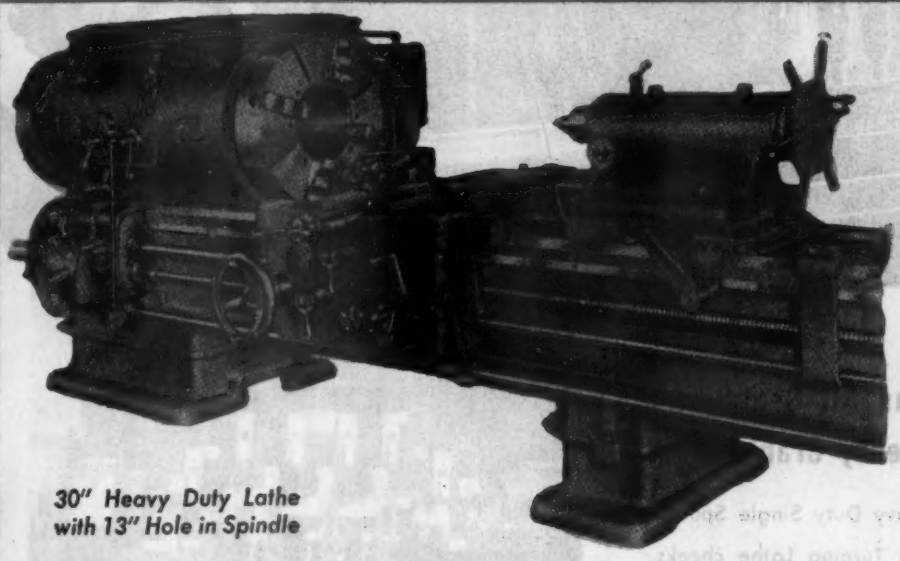
Name..... Title.....
Company.....
Street.....
City..... State.....

News of the 35

HYDRATROL *Lathes*

Large Hollow Spindle Type

Which Effected These 4 Outstanding Savings and Efficiencies in a Large War Plant!*



30" Heavy Duty Lathe with 13" Hole in Spindle

5 sizes-18" to 36"

Small, 18" up to 7-1/4" Hole

Medium, 24" up to 12" Hole

Large, 27" up to 13" Hole

Large, 30" up to 14" Hole

Large, 36" up to 16-1/2" Hole

(Standard Type lathes, 16" to 36")

(From Letter in Our Files)

* "First, the adaptability and the ease of handling the _____ in and out of the Hydratrol Lathes increased operating efficiency 15 to 20%.

"Second, the roughing operations cut the operating time in half, as performed in other plants using conventional equipment.

"Third, finishing the end of _____, consisting of rough and finish bore and grinding, face and finish turn, was reduced from 16 hours to 5 hours.

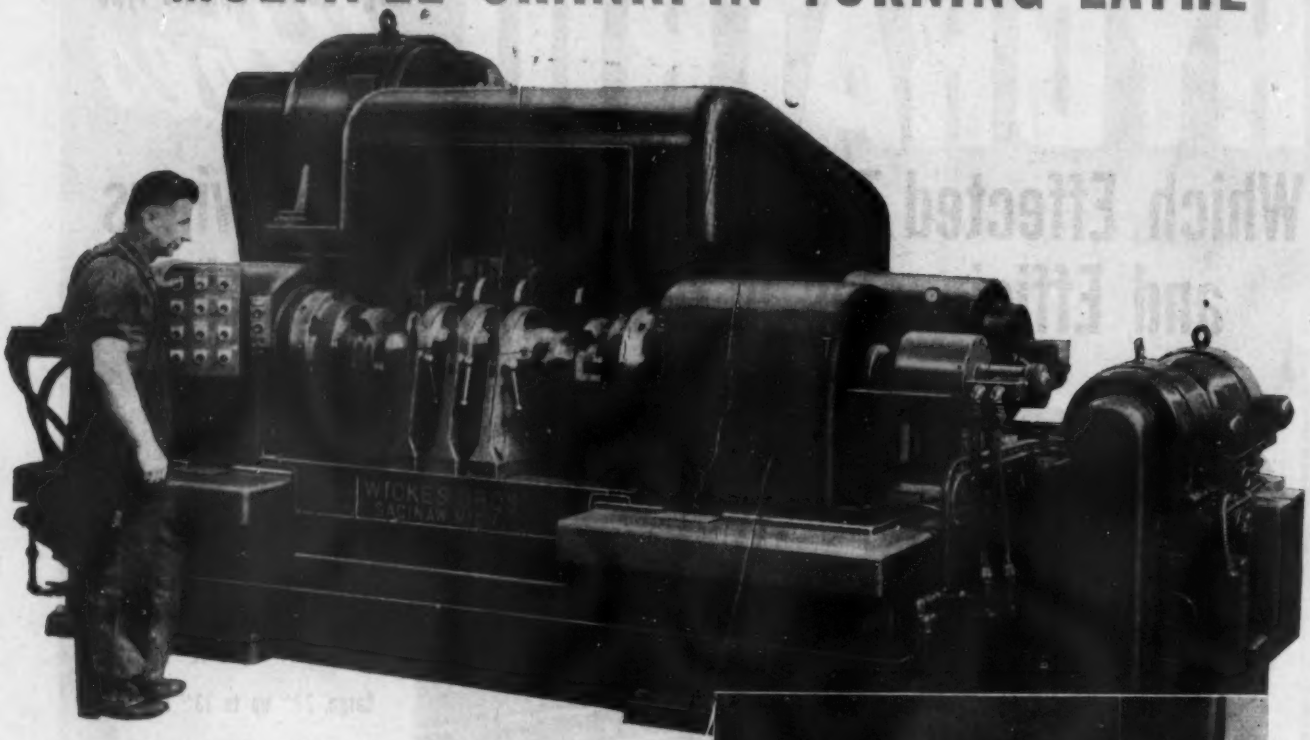
"Fourth, finish turn operation was reduced from 8 hours to 4 hours."

Why not investigate the possibilities of the Large Hollow Spindle Type of HYDRATROL LATHE in YOUR plant?

Lehmann MACHINE COMPANY

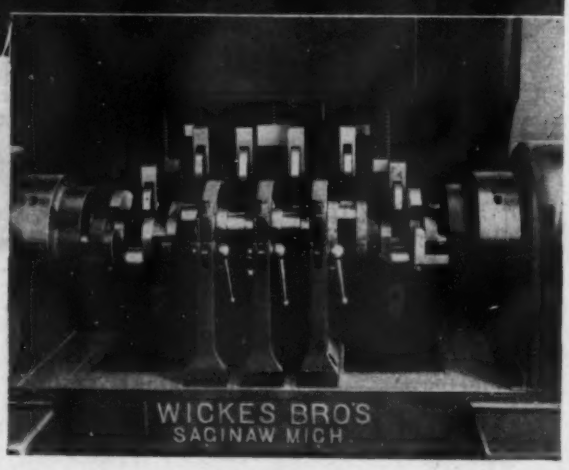
CHOUTEAU AT GRAND . . . ST. LOUIS 3, MISSOURI

WICKES MODEL MP-8 AUTOMATIC MULTIPLE CRANKPIN TURNING LATHE



Automatically Turns All Crankpins Simultaneously On Heavy Crankshafts

The Wickes Model MP-8 Heavy Duty Single Spindle Automatic Multiple Crankpin Turning Lathe cheeks, turns and fillets all crankpins simultaneously on heavy multiple throw crankshafts required for aircraft, marine and similar large engines. This lathe is of the very latest design and is extremely rugged making it suitable for the heaviest of roughing cuts. This same rigidity also makes the lathe capable of the very smoothest of finishing cuts with extreme accuracy in stroke, index, diameter and spacing of crankpins.



Inset shows tooling arranged for turning all crankpins on 6-throw aircraft crankshaft.

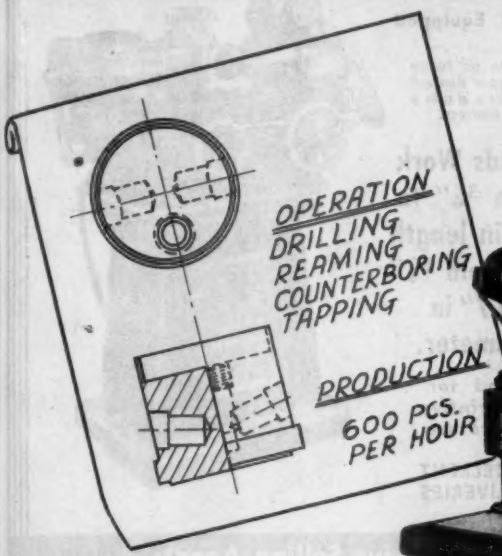
The control of the lathe is entirely automatic through electrical push button panel, it being necessary only for the operator to load crankshaft and depress electrical push button and machine goes through entire work cycle automatically and stops in unloading position. Write for complete information.

Wickes

WICKES BROTHERS • SAGINAW, MICHIGAN • RECOGNIZED QUALITY SINCE 1854

CRANKSHAFT TURNING EQUIPMENT • DOUBLE-END BORING, HEAVY DUTY ENGINE, SPECIAL PRODUCTION LATHES • SIMPLEX BLUE PRINTERS

Avey Automatic METHOD No. 7



THE Avey CAM FEED UNIT

No. 1 Size—1/2" capacity in cast iron.

No. 2 Size—7/8" capacity in cast iron.

Designed for multiple operations on a multiplicity of parts—(clamping six parts at a time)—parts with identical operation at 180°—(index fixture on index table)—drilling, reaming, and tapping.

Accelerated production by multiple fixturing — free loading or indexing while machine is in operation, multiple operations in time required for longest single operation.

METHOD No. 7 — Higher production, lower cost per piece, duplicate operations on opposite side of work performed at one clamping — high quailty work obtained speedily, efficiently with minimum of supervision.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.

A GREAT DEVELOPMENT IN SHAPER *Design and Performance*

THE NEW 20" QUEEN CITY *Super Twenty Shaper*

The very latest in shaper design and efficiency. This is a heavy, rugged machine equally suited for both the daily grind of heavy production and general tool room work.

The ram is of the V-type of wide bearing; the clutch is the dry multiple-disc type, requiring minimum attention. The feed range is extremely versatile — from .008" to .191" — easily, quickly changed. A high torque motor for the power rapid traverse is standard. An electrical limit switch in the rail offers complete motor control. Timken Bearings are used throughout.

For top performance, speed, versatility, accuracy, and unusual economy, this Shaper will meet with your entire satisfaction.

For full details, write Dept. AM.

QUEEN CITY MACHINE TOOL Co.
217 E. SECOND ST.
CINCINNATI 2, OHIO

LEACH External Grinder

PRICE
$875.00
Fully Equipped

Write us today for your nearest dealer's name and address.

Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

Send for Descriptive Literature

EXCELLENT DELIVERIES

Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

"IF HE LOVED ME HE'D USE MAGNUS HAND CLEANER BEFORE WRITING A LETTER."

No one wants to leave your plant with dirty hands. That's the rub. They want clean hands, but they want them *fast.* And they'll use cheap, harsh, harmful hand cleaners that lead to infections and dermatoses unless you make sure they use a really safe, as well as fast and effective cleaner.

Keep your plant washrooms supplied with Magnus Hand Cleaner. It cleans fast, but contains no scratchy abrasive or harsh chemicals that rob the skin of natural oils. It cleans well, leaving hands soft and free from chapping or cracking.

We'll gladly send a liberal sample for a try out in your plant.

Magnus
MAGNUS CHEMICAL COMPANY
60 SOUTH AVENUE - GARWOOD, N. J.
INDUSTRIAL CLEANERS

PRECISION MACHINE VISES

All Perkins Swivel Vises swing 360 degrees and have complete circle graduations. All Angle Vises raise 92 degrees.

Write for Bulletin No. 110

MILLER-KNUTH MFG. CO. OMAHA, NEB.

Making broaches comes pretty close to being a *Fine Art*

There is no branch of tool making that requires as much actual first-hand experience as the design and manufacture of accurate and dependable broaches. Seemingly, negligible factors often result in large Differences in the effectiveness and the life of the broach. Very seldom are any two broach problems just alike and only the broach organization with wide experience is capable of evaluating all the factors which enter individual broaching problems.

For maximum economy and effectiveness, let such an organization supply your broaching tools.

What is thought to be the largest solid high speed steel gear tooth broach (893 lb.) ever produced.
IT CUTS 55 INTERNAL GEAR TEETH IN A COUPLING SLEEVE 48 TIMES FASTER WITH INCREASED ACCURACY AND CONSISTENCY THAN THESE TEETH WERE CUT BY THE PREVIOUS OPERATION

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

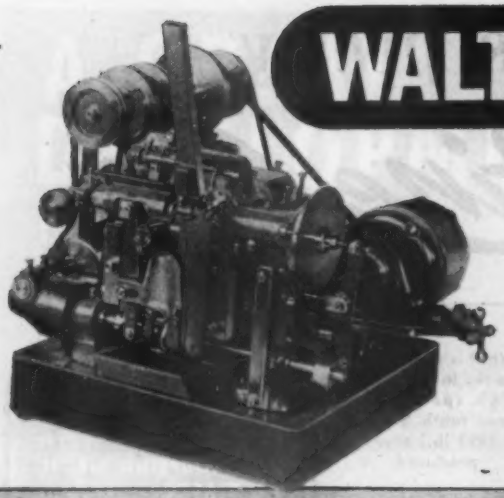
MEMBER BROACHING TOOL INSTITUTE

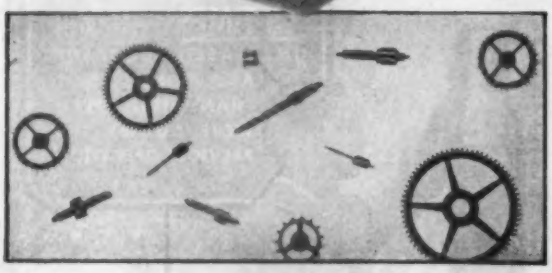
NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5800 ST. JEAN · DETROIT 13, MICH.

WALTHAM PINION and GEAR CUTTERS





Produce Small Parts to Tool Room Standards of Precision

These machines are designed for producing fine pitch gears and pinions such as are used in watches, instruments, time fuses, etc. They are sturdily built and have an unusual capacity for machines of this type.

Whether for cutting gears or pinions, the same process is used in WALTHAM machines. This feature involves the use of a revolving cutter making successive cuts on blanks held and indexed by the work spindle. Cutter spindle is designed for high speeds. Operation is extremely simple and requires no special skill to achieve speed and accuracy in parts production.

Made in single cut, multiple cut and magazine feed types.

SPECIFICATIONS

PINION MACHINES

Diameter capacity (approx.)—½".
Coarsest pitch (about) 32 D.P.
Strokes of work slide for pinions .25" to .45".
Strokes of work slide for stacked gears .85" to 1".
Bench space (countershaft drive) 19" x 18".
Bench space (motor drive) 26" x 25".

GEAR MACHINES

Pitch diameter, capacity 1½".
Strokes for work slide: .40", .65", 1.00", 1.25".

Send for literature giving complete details.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

HOLD EVERYTHING ... here's TODAY'S BUY

Before you decide on new toolroom equipment, check the type of jobs that come to your shops. Note also how often small jobs accumulate, then have to be scheduled for machines better employed on larger work.

If you have 2½ sq. ft. of floor space vacant, that's the spot for a LINLEY High Speed Vertical MILLING and JIG BORING machine . . . specifically designed to clean up the small jobs in rapid succession.

It has just what you need . . . 8 spindle speeds to 4250 r.p.m., direct micrometer setting, grease sealed bearings, no backlash in quill travel, ample table size 7" x 17½" . . . a precision machine for die making, jigs, models, metal patterns, milling, reaming, boring, etc.

Jobs that the LINLEY so easily handles are on the increase . . . will flood toolrooms when war work is over. Why not check on the LINLEY now?

BULLETIN ON REQUEST

LINLEY

BROTHERS COMPANY
884 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

Metalmaster

12", 14" & 16" LATHES

• Fast, accurate for war production . . . durably constructed, precision built to meet peacetime manufacturing needs. Write for catalogs describing in detail the advantages of METALMASTER Lathes.

The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

Heavy-duty soluble oil solves many "in-between coolant and cutting oil" jobs

● One of the most important wartime developments in cutting fluids, made by Standard Oil, was Stanicool HD—a heavy-duty soluble oil. It filled a gap between soluble oils and cutting oils. For example:

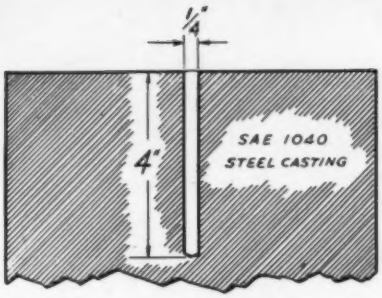
Certain metal cutting operations demand the high degree of cooling afforded by a water-and-oil emulsion but a greater degree of tool protection than is usually obtained from soluble oil. When cutting oil is used on these jobs, over-heating occurs.

Stanicool HD has eliminated these problems in many shops. Some of these jobs are briefly described at the right. A Standard Oil Lubrication Engineer can give you other examples and help you apply Stanicool HD to fill the gap between soluble oils and cutting oils in your plant.

Call the nearest Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois, for a Lubrication Engineer. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Gasoline Powers the Attack . . .
Don't Waste a Drop!

STANICOOL HD



Drills ground 1/3 as often.

Drilling a ¼ inch hole, 4 inches deep, in SAE 1040 Steel Castings, drills were sharpened every six pieces. Both soluble oil and cutting oil were tried. Both failed to give satisfactory results. An emulsion of 8 parts of water to 1 Stanicool HD increased tool life to 18 pieces per grind.

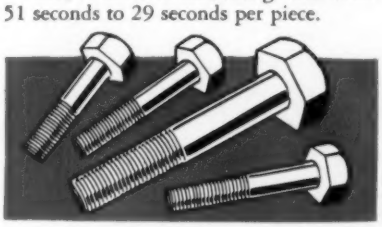
Production jumps 200% with longer tap life.

A mixture of one part Stanicool HD and ten parts water, used on a job of tapping high carbon steel, made it possible for a tap to last a full day. When using sulphurized cutting oil, taps lasted only one-half hour. More important, production jumped 200% with the use of Stanicool HD.

The greater cooling and better chip removal provided by soluble oil, plus the heavy-duty quality of Stanicool HD, will often give increased tool life and production on tapping operations where cutting oil would ordinarily be used.

Production time cut in half without impairing tool life.

A deep spading operation on a lathe making 75mm. anti-tank shells was giving good tool life and finish, but it slowed up production all along the line. When Stanicool HD replaced the conventional soluble oils that had been used, it gave equally good tool life and finish. On top of that, it reduced machining time from 51 seconds to 29 seconds per piece.



. . . either too hot or too slow.

A cutting oil was used on a turret lathe which was turning and threading bolts from SAE 4140 steel. High temperatures were encountered. Ordinary soluble oil cooled the tools, but too short tool life was experienced when heavy feeds and a cutting speed of 200 feet per minute were maintained. Stanicool HD mixed one part with four parts of water eliminated overheating and poor tool life, and permitted the maintenance of the high production rate.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

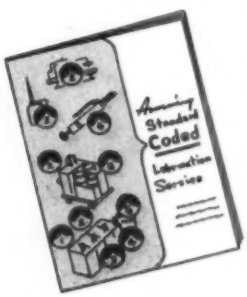
★ LUBRICATION ENGINEERING

LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATI

Make Standard CODED LUBRICATION part of your reconversion plan

PERHAPS YOUR plant is one that will "start from scratch" in reconverting to civilian production. Now is the time to put lubrication of that plant on a sound basis. Start by putting Standard Coded Lubrication Service to work. Make sure, through proper lubrication, that you get maximum life and production from the equipment you install.

Standard Coded Lubrication Service is the simplest method known for getting the *right* lubricant in all the *right* places. The three steps at right illustrate how simple it is. The booklet illustrated gives a complete description. Write for a copy, or, better still, have a Standard Oil Industrial Service Representative call and discuss this system with your men in charge of lubrication.

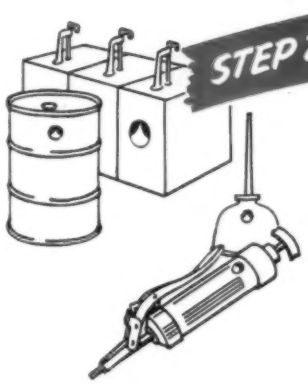


Call the local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you —or for a copy of the booklet. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

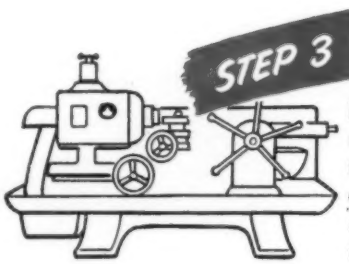
Gasoline Powers the Attack... Don't Waste a Drop!

How Standard Coded Lubrication Service is applied

Each lubricant used in your plant is assigned a number. These numbers are recorded on a lubrication chart—this is the only record making that is ever needed—and copies are kept in the oil room, purchasing department files, or wherever else they may be useful.



The lubricant in each storage container—barrel, drum, or dispenser—is identified by the number assigned to it. Numbered decals, in two color combinations, are used for this purpose—another example of the simplicity of the system.



All points to be lubricated in your plant are also marked with a numbered decal indicating *what* lubricant is to be used, and *where* it is needed.

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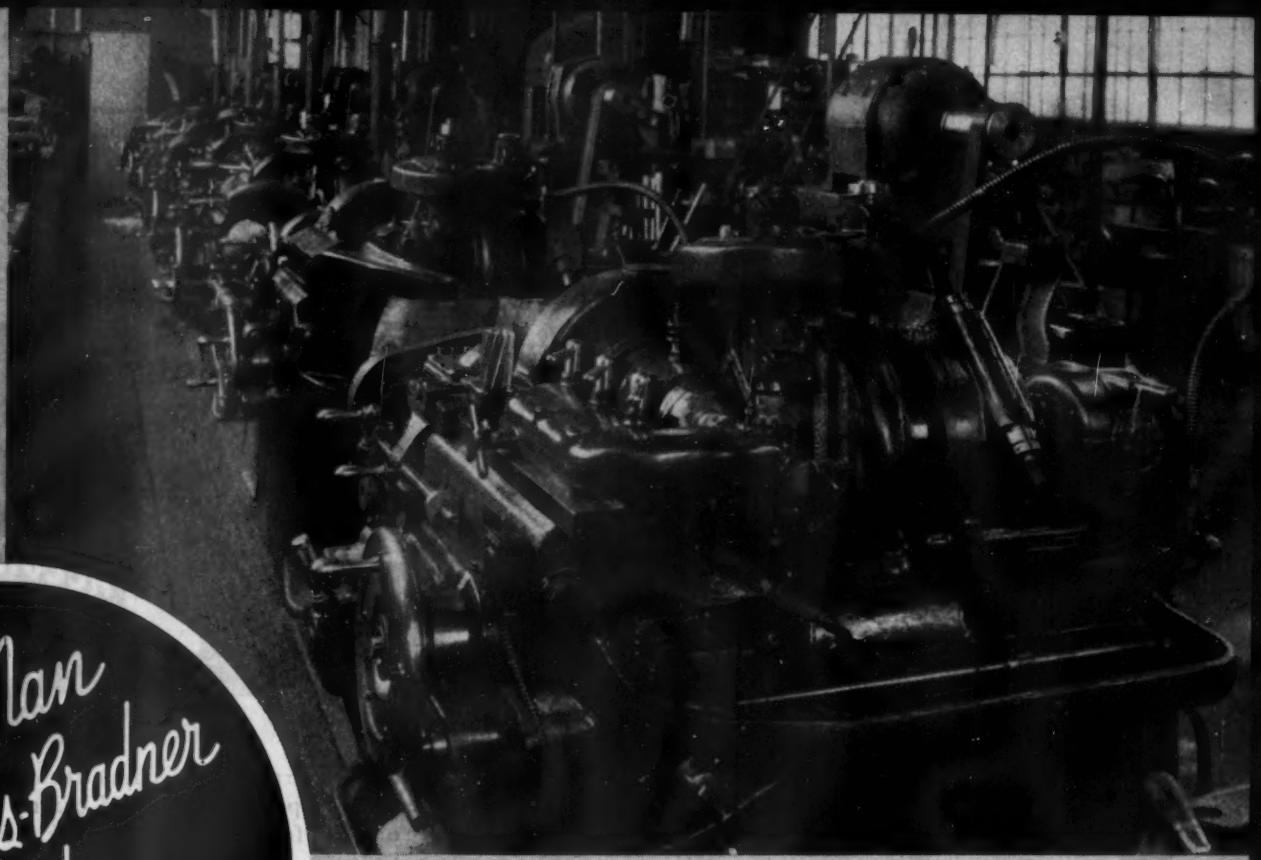

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One Lees-Bradner
and
an Idea

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HS-7

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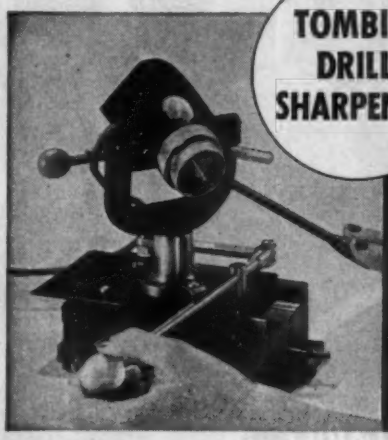

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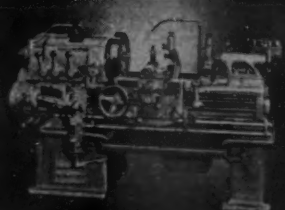

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IN the same manner that so many complex machines, essential to Man's progress, developed from the fundamental principle of the screw, so too, has broaching developed from crude tools capable of limited uses, to mighty machines capable of performing metal removing operations with speed and precision, in an almost endless variety of shapes and sizes . . . and making them quicker, cheaper and BETTER!

The first broaching machines were invariably arbor presses, and were generally used to cut keyways in pulleys and gears.

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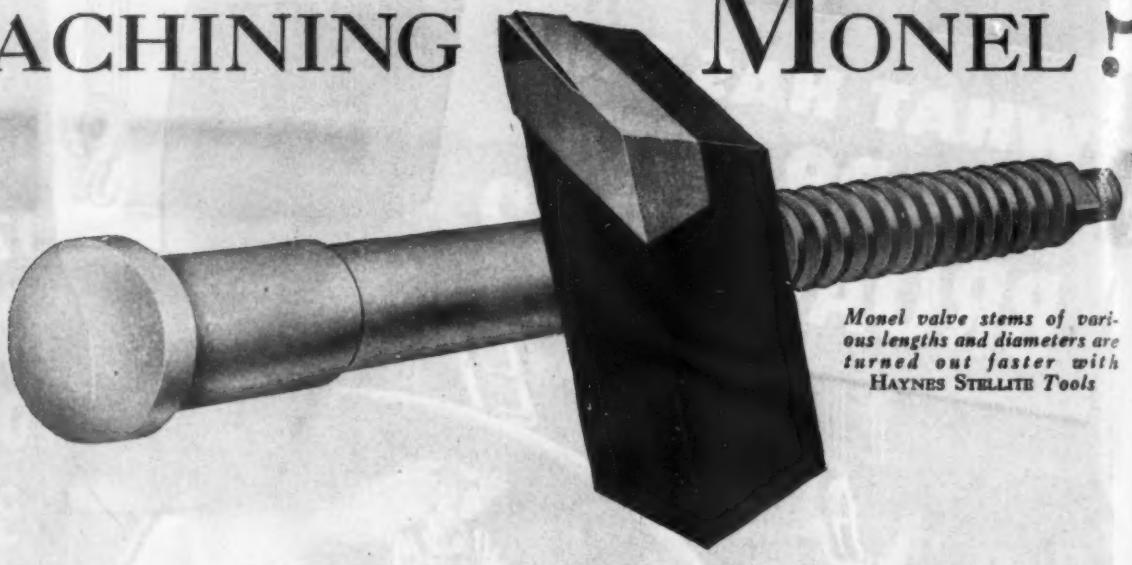

Monel valve stems of various lengths and diameters are turned out faster with HAYNES STELLITE *Tools*

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If you are machining Monel, a letter or phone call to our nearest office will bring a representative to tell you more about the production records HAYNES STELLITE cobalt-base alloy tools are making on this metal . . . and also on steel, cast iron, bronze, and other materials.

If you prefer, you can learn more about 98M2 tools . . . and how they can be used to reduce floor-to-floor time and machining costs . . . by writing to Kokomo for the descriptive booklets illustrated here.

Price List—For a descriptive price list of HAYNES STELLITE 98M2 metal-cutting tools, write and ask for Form 5783.

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Operating Information—This new booklet is full of operating information on 98M2 Tools. To obtain a copy, simply ask for Form 5350.

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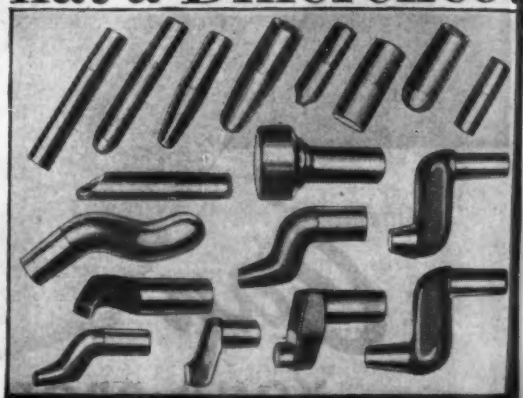

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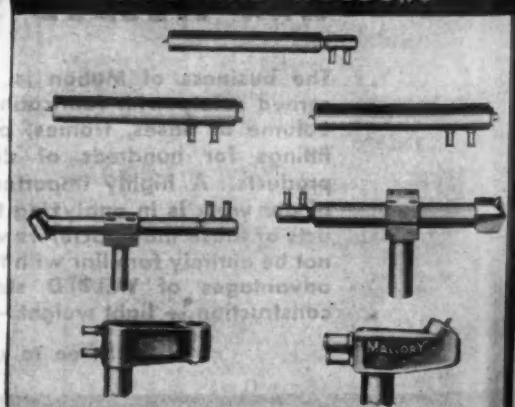

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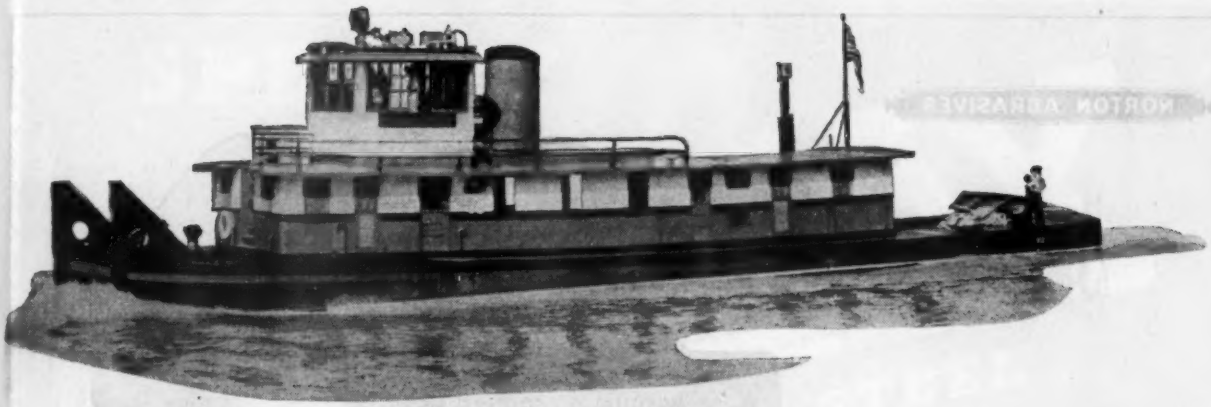

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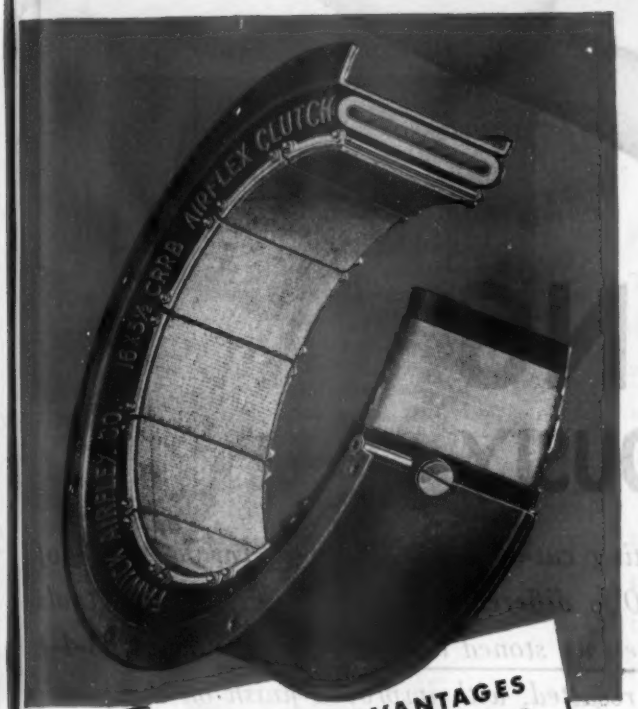

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TRADE MARK, REG. U.S. PAT. OFF.

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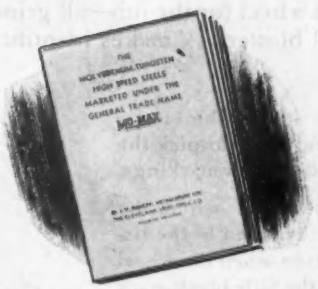

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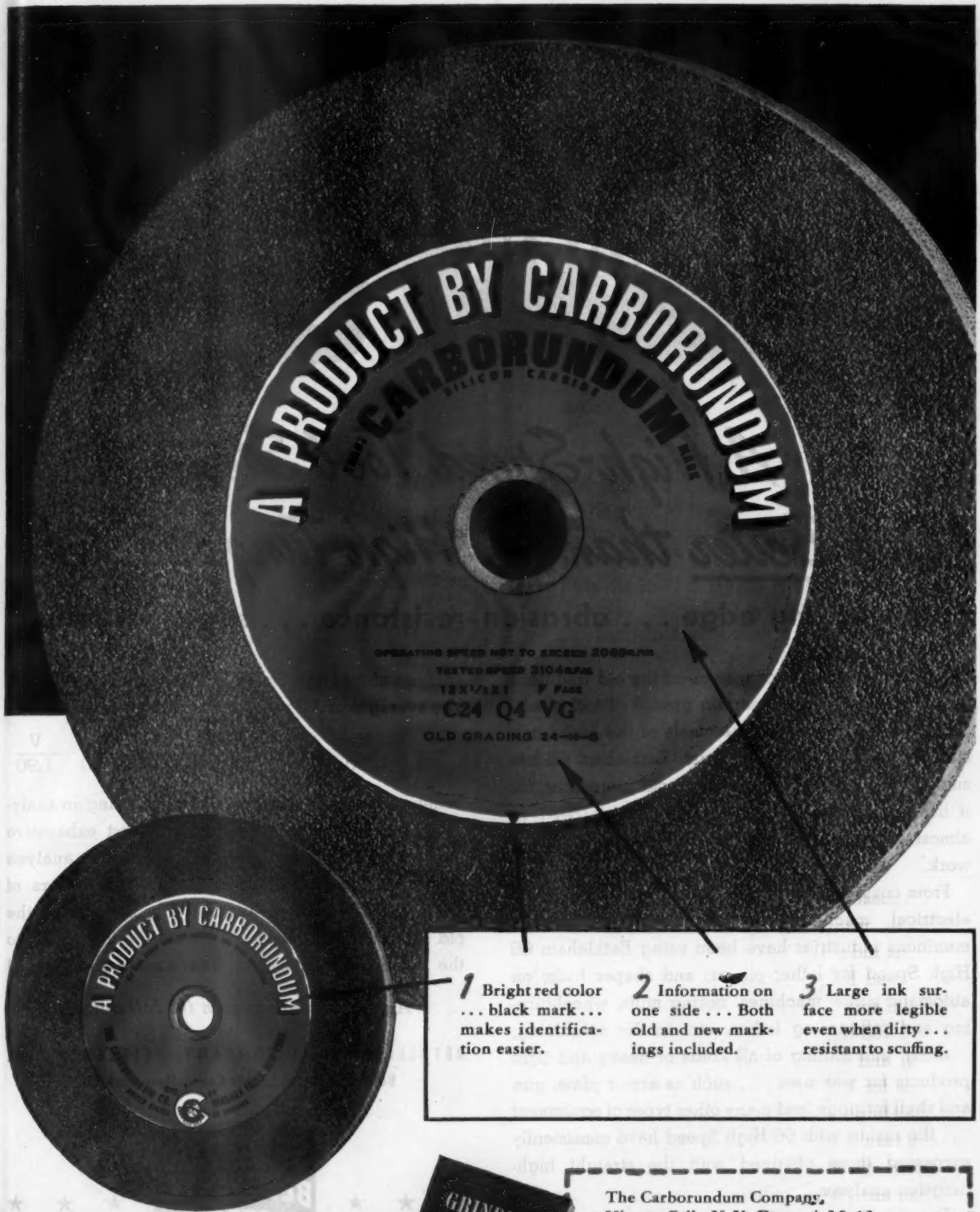
TRADE MARK

FOR EVERY ABRASIVE APPLICATION

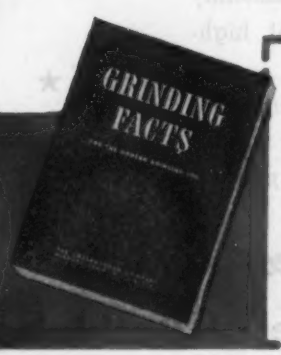
("CARBORUNDUM" and "ALOXITE" are registered trade marks of and indicate manufacture by The Carborundum Company)



1 Bright red color . . . black mark . . . makes identification easier.

2 Information on one side . . . Both old and new markings included.

3 Large ink surface more legible even when dirty . . . resistant to scuffing.



MAIL COUPON TODAY if you haven't received your free copy of "GRINDING FACTS." It's the new book by "CARBORUNDUM" that explains all about the new wheel markings. It's also full of information on the selection, care and use of grinding wheels!

The Carborundum Company,
Niagara Falls, N. Y. Dept. A.M. 12

Please send me my free copy of "GRINDING FACTS"

Name.....

Firm.....Title.....

Address.....

Bethlehem 66

A High-Speed Tool Steel that's Better than the High-Tungsten Types

Better cutting edge . . . abrasion-resistance . . . shock-resistance

The war has broken down some of the old traditions that clung for years to certain grades of tool steels. One of these concerned the steels of the high-tungsten types. During the war years, Bethlehem 66 has successfully uprooted many of the old prejudices, for it has proved itself definitely superior to 18-4-1 in almost every conceivable type of heavy production work.

From coast to coast, huge plants in the automotive, electrical, machine tool, steel, shipbuilding, and munitions industries have been using Bethlehem 66 High Speed for lathe, planer, and shaper tools; on automatic screw machines, boring mills, wheel-turning and roll-turning lathes, etc. In the machining, ...ning, and milling of all kinds of heavy and light products for war uses . . . such as armor plate, gun and shell forgings, and many other types of equipment . . . the results with 66 High Speed have consistently surpassed those obtained with the straight high-tungsten analyses.

Despite these excellent results Bethlehem continued its research and experiment. Now, after months of intensive shop and laboratory work, an *improved* analysis of 66 High Speed has been made available. The averages of its leading components are as follows:

C	Mn	Si	Cr	W	Mo	V
.84	.30	.30	4.20	6.50	5.00	1.90

When you use the improved 66, you're using an analysis that has been subjected to the most exhaustive and severe tests yet devised. This new analysis has already been approved by tool-steel users of nation-wide reputation. It's not only better than the old high-tungsten steels . . . it's superior, even, to the former 66 composition. That's real performance!

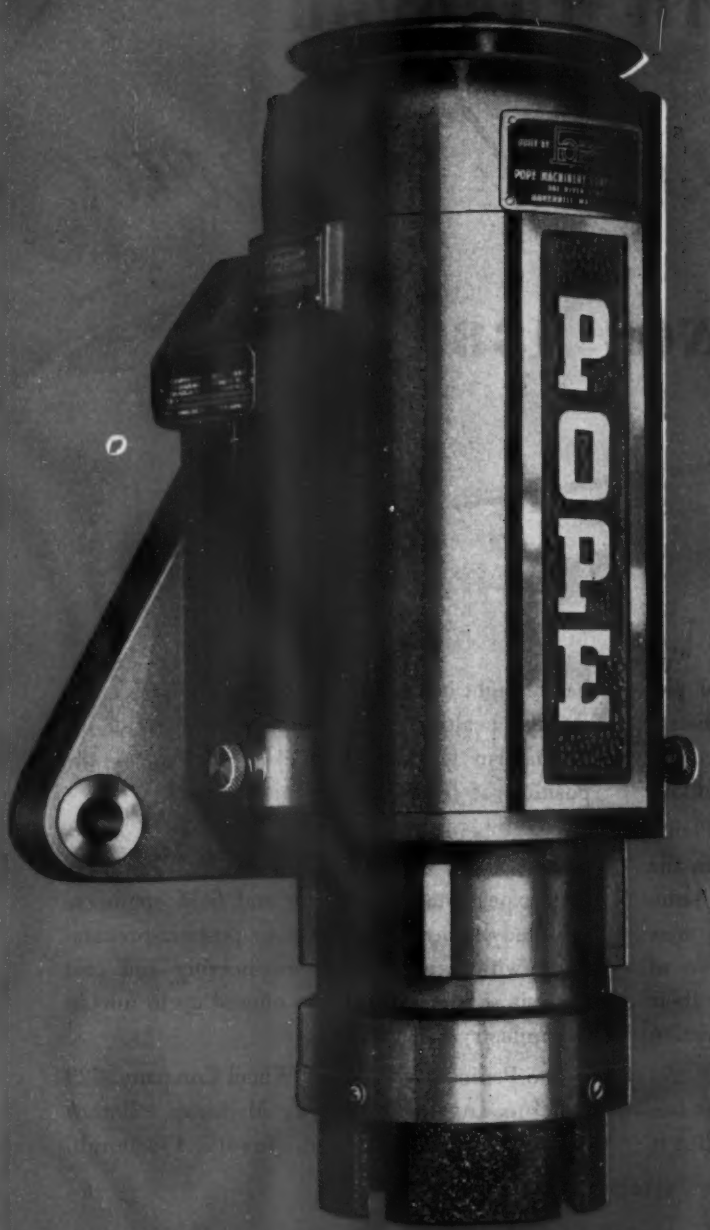
Ask a Bethlehem man for full details

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Bethlehem Steel Export Corp., New York City

★ ★ ★ BETHLEHEM STEEL ★ ★ ★

Improved 66 *High-Speed* . . . one of Bethlehem's BIG 8 Tool Steels

Picture This POPE PRECISION SPINDLE *on Your* MACHINES



This POPE Vertical Motorized Spindle with *sealed lubrication*, totally enclosed, fan cooled motor and super-precision bearings means *better work and more of it.*

The coolant is fed down through the hollow spindle, cooling motor and bearings on its way to the inside of the cup wheel where it is most effective for cooling the work.

This Spindle, like all POPE Precision Grinder Spindles, will give you more production and finer finishes. Ask us to send you Data Sheet A from which we can furnish recommendations and estimates.

POPE Vertical Spindles are available with 3, 5, 7½ or 10 HP Motor. Speed may be 600, 750, 900, 1200, 1800 or 3600 RPM, 60 cycle AC current. Even higher speeds are attainable with frequency changers.

POPE Vertical Motorized Spindles are used not only for surface grinders but for a variety of other purposes. Where working loads are largely radial, bearings are arranged to take care of them.

POPE

REG. U. S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

GROWTH THROUGH *Distinguished Service* SINCE 1889

IN EVERY INDUSTRY there are those who pioneer—those who set out, through constant study, research and experiment, to chart the course of progress down which others follow.

Fifty-five years ago, the newly-founded Peninsular organization elected to be a pioneer in the grinding wheel industry. Since that time, Peninsular has originated and contributed many new and important advancements in the fabrication of abrasive wheels—in the machinery for their manufacture—in the methods for their application to modern manufacturing problems.

To accomplish this has not been easy. It has taken time—money—and endless striving. But it has brought its rewards. And chief of these is the steady, healthy growth that has brought the Peninsular Grinding Wheel Company to the position of leadership it enjoys today.

A STANDING INVITATION

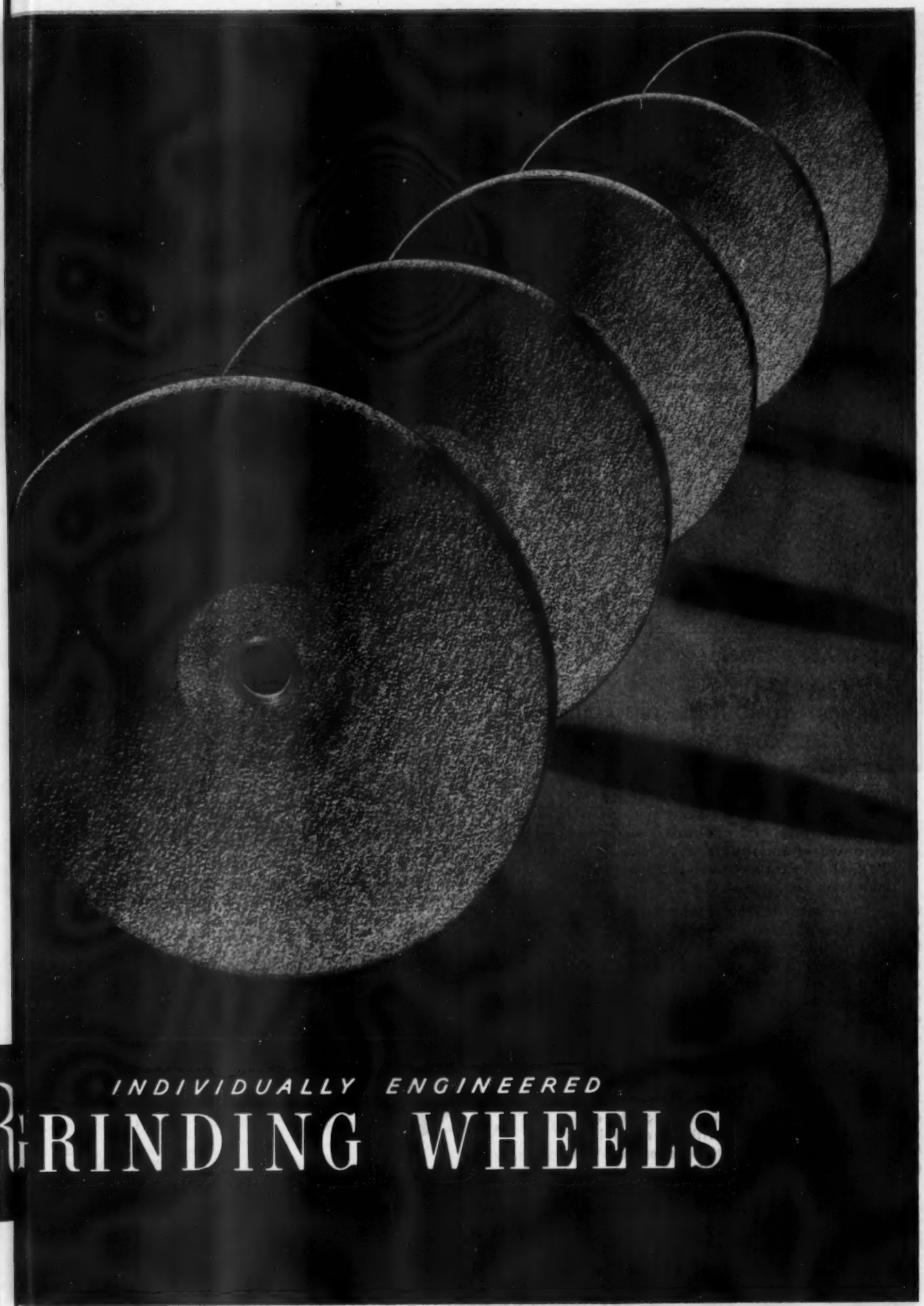
Our expert staff of factory and field engineers are ready today to help in your postwar preparation—with a production, engineering and cost analysis service beyond any offered up to now in the industry.

The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7, Michigan. *Branch Offices:* Chicago, Cleveland, Newark, Pittsburgh.

SPECIALISTS IN RESINOID BONDED WHEELS

PENINSULAR

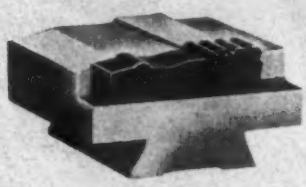
SINCE 1889


INDIVIDUALLY ENGINEERED
RINDING WHEELS

OPERATORS ARE TRAINED *Quickly*

TO SECURE ±.0005" ACCURACY *with the* Wickman PROFILE GRINDER

TYPICAL EXAMPLES OF WORK GROUND AND INSPECTED ON THIS MACHINE WITHOUT USE OF RADIUS DRESSER OR FORMED WHEEL



Cemented-Carbide Tipped Form Tool
Width of Carbide Tip.....1¾"
Stock Removed .....approx. .040"
Grinding time including set-up and complete inspection of contour before removal from machine ..... 3½ hrs.

Circular Form Tool with Preformed Cemented-Carbide Tips
Stock Removed .....015"
Grinding time including set-up and complete inspection before removal from machine
approx. 2 hrs.

The Wickman Profile Grinder is a machine which makes possible substantial savings in machining time. It produces extremely accurate work, tolerances even closer than ± .0005" being secured with reasonable care in operation.

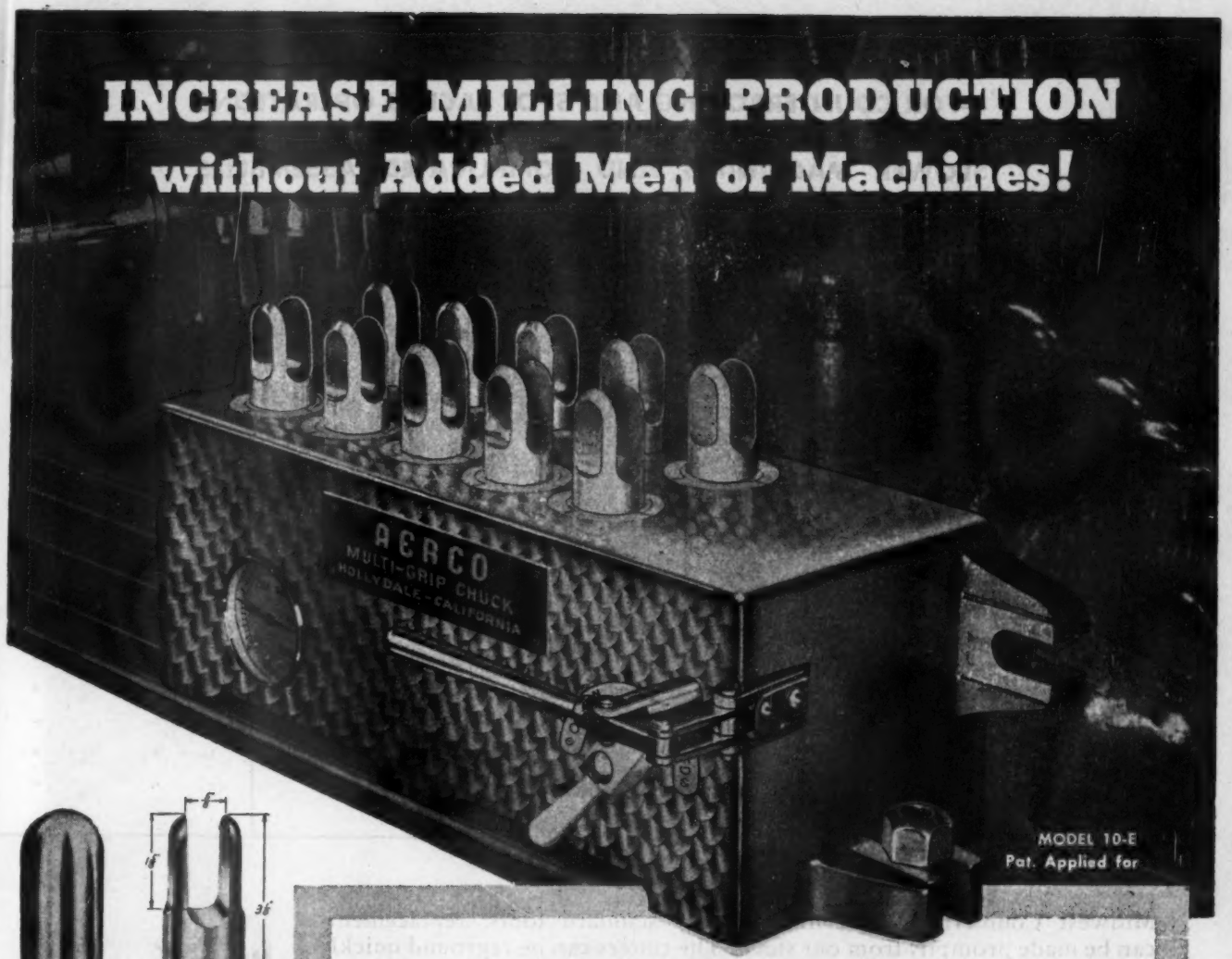
Of most importance, these production advantages can be effected in your plant with relatively unskilled operators assigned to the machines. Any person of average intelligence can be trained in a very short time to become thoroughly efficient in the Wickman method of profile grinding.

The layout and brain-work are done in the drafting room. The operator has nothing to measure. She sees it done. She knows at all times where every point on the contour is, during its development, in relation to every other point on the tool without removing it from the machine for partial inspection. Write for completely descriptive literature.

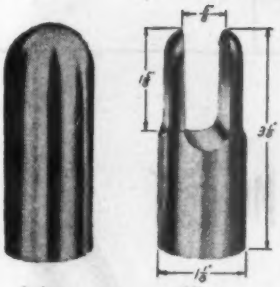
BUY MORE—AND MORE—WAR BONDS

THE Wickman CORPORATION
15539 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

INCREASE MILLING PRODUCTION without Added Men or Machines!



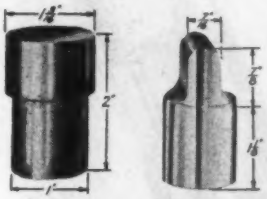
MODEL 10-E
Pat. Applied for



Before After

Aluminum Parts

These aluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before After

Chrome Steel Parts

These parts, high heat treated of Chrome-moly, were produced at the rate of 62 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

These parts milled with the use of the Aerco Multi-Grip Chuck show its versatility.

with the AERCO HYDRAULIC MULTI-GRIP CHUCK

Two rows of collets hold ten parts and both rows are milled simultaneously and with but a single loading increasing production as much as 500%.

Self-centering aligning collets insure perfect on-center milling regardless of slight shank diameter variations. Safety stop prevents damage to collets should all stations not be loaded.

Aerco Multi-Grip chucks may be used for both vertical and horizontal milling. Work is held rigidly in collets and cannot turn or be pulled out during milling operation, however clamping pressure is instantly releasable and self-opening collets can be quickly re-loaded.

Collet sizes range from ⅛" to 1¼" and are available in round, square or hexagon shapes.

Representatives Wanted in Principal Cities

MANUFACTURED EXCLUSIVELY BY

AERCO CORP.
HOLLYDALE, CALIFORNIA

ARMY E NAVY

WRITE FOR NEW FOLDER

MIDWEST COUNTERBORE SETS

—FOR COUNTERBORING AND SPOT FACING OPERATIONS THAT SAVE THE TIME AND COST OF EXTRA SET-UPS, OTHER SLOWER MACHINING AND COMPLICATED ASSEMBLIES

Set No. 1 Contains The Following Items:

One #5MB Group Holder
One #7MB Group Holder

COUNTERBORES

9/16" Dia.	7/8" Dia.
5/8" "	15/16" "
11/16" "	1" "
3/4" "	1 1/16" "
13/16" "	1 1/8" "

COUNTERSINKS

3/8" Dia.	60 Deg.
1/4" "	82 "

PILOTS

5/16" Dia.,	1/4" Shank
3/8" "	1/4" "
7/16" "	1/4" "
1/2" "	1/4" "

PILOTS

9/16" Dia.,	1/4" Shank
5/8" "	1/4" "
11/16" "	1/4" "
3/8" Dia.,	5/16" Shank
7/16" "	5/16" "
1/2" "	5/16" "
9/16" "	5/16" "
5/8" "	5/16" "
11/16" "	5/16" "
3/4" "	5/16" "
13/16" "	5/16" "
7/8" "	5/16" "
15/16" "	5/16" "
1" "	5/16" "

Midwest Counterbore Sets include only standard tools; replacements can be made promptly from our stock. The cutters can be reground quickly and easily; and reground many times before replacement is necessary.

Each set is furnished with a corresponding range of alloy steel, hardened and ground pilots. Pilots are chamfered at front end and they are designed for quick interchanging or removing in case of breakage. Each set is furnished with Group Holders fitted with *Midwest Taper and Pin Drive.* There is perfect alignment between the holder and cutter—highly important in an assembled tool. Each holder handles a wide variety of cutter sizes. Cutters can be interchanged in a jiffy.

You can depend upon Midwest Precision Quality and Manufacture to provide faster cutting operations, sustained accuracy and economical performance.

Midwest also makes special combination counterbores, step counterbores for two or more diameters, holders with stop collars and other production-type combinations.

Cutaway View Showing Features of Midwest Counterbore Assembly.

Midwest offers a complete designing and engineering service. Send us an outline of any metal cutting problems you may have and let us send you suggestions on the way to solve them with a minimum of tools and operations.

Consult the Midwest Representative located nearest to you. He is thoroughly experienced and can ably assist you.

Midwest Precision Metal Cutting Tools are also handled by many leading Industrial Distributors.

MIDWEST TOOL & MFG. CO.

MILLING CUTTERS • SLEEVES • COUNTERBORES • END MILLS • REAMERS • SPECIAL TOOLS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

2356 WEST JEFFERSON AVENUE • DETROIT 16, MICHIGAN

"FIT FOR DUTY"

● Only first-class cutting tools can turn work out fast enough — and accurately enough — to be rated as "fit for duty" on today's vital production line!

Tools are weapons Treat 'em Right

MORSE THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

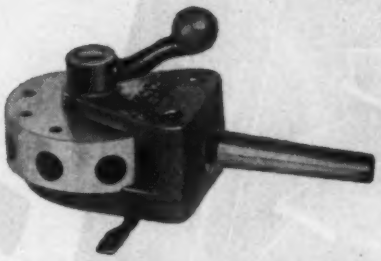
NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

How to do turret lathe machining ... on your engine lathe!

THESE 3 SPECIALTIES LATHE ACCESSORIES MAKE IT POSSIBLE

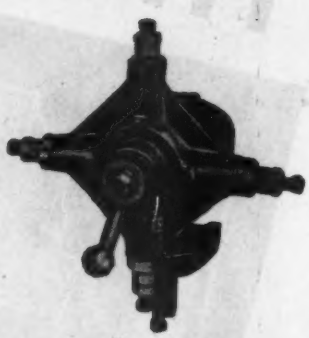
SPECIALTIES CROSS-SLIDE TURRET

Gives you four working positions without tool changes . . . allows multiple machining operations on one lathe. Easy to operate—merely flip the turret from one position to another. No. 30 for 9" to 12" lathes; No. 60 for 13" to 20" lathes.



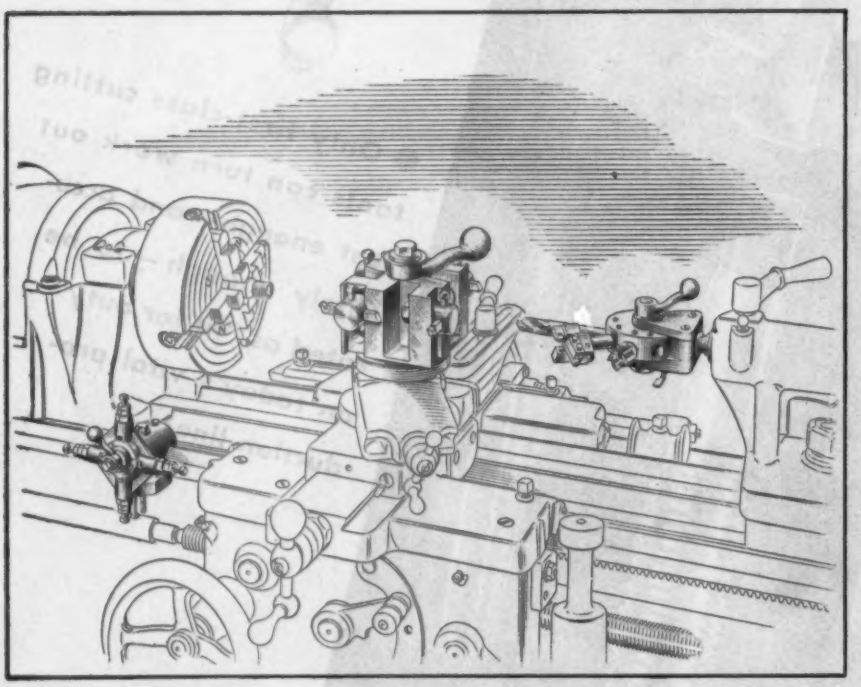
SPECIALTIES TAIL-STOCK TURRET

Quickly converts engine lathe into 4-way turret lathe for end work. You can perform four different operations with the four positions. No. 58 with No. 2 Morse Taper Shank; No. 103 with No. 3 Morse Taper Shank; No. 104 with No. 4 Morse Taper Shank.



SPECIALTIES LATHE STOP

For multiple operations — eliminates repeated measuring. You measure only once for each operation. Once the four positions are set, you just index. No. 10 for 9" to 12" lathes; No. 20 for 13" to 20" lathes.



CONVERT YOUR ENGINE LATHE INTO A TURRET LATHE

Any lathe can be converted into a complete, accurate, precision turret lathe in *minutes* with these SPECIALTIES lathe accessories. Attached to your engine lathe, the SPECIALTIES Cross-Slide Turret, Tail-Stock Turret and Lathe Stop permit you to do any kind of work—forming, roughing, boring, finishing, tapping—without stopping the lathe or changing tools.

Mail the coupon for complete information about this SPECIALTIES production team designed to help you increase the capacity of your lathe and cut machining costs.

SPECIALTIES Manufacturing Co., Inc.
45 Farrand Street, Bloomfield, N. J.

Please send me full information on SPECIALTIES lathe accessories.

Name_____

Company_____

Address_____

City_____ State_____

SPECIALTIES
MANUFACTURING COMPANY

Threadwell COLD-TEMPER

Has The Answers Down Cold!

Question: Why do taps need to be cold-tempered?

ANSWER: The new, scientific cold treatment at 120° below zero, pioneered by Threadwell in the tap field, makes COLD-TEMPER Taps harder yet less brittle than high speed taps receiving only the usual heat treatment. Threadwell *Cold-Temper* Taps are recommended for cutting steels, cast iron, alloys, plastics and abrasive materials. Performance tests have proved that they cut *more and better threads per tap.*

Question: Do Threadwell COLD-TEMPER Taps cost more than ordinary high speed taps?

ANSWER: No. This extra treatment is simply a plus value for users of Threadwell Taps, at no extra cost.

Question: How can I be sure that the taps I buy are genuine COLD-TEMPER Taps?

ANSWER: By specifying *Threadwell.* All Threadwell High Speed Taps are now *cold-tempered.* You can identify Threadwell Taps not only by the name on the shank but by the color "*i-dot-ification*" (*red* dot for high speed cut thread, *white* dot for commercial ground, *blue* dot for precision ground) and by the Threadwell transparent plastic "*Tap-Capsule*" which provides every ground thread tap with complete protection and makes it easy to identify size and type before unwrapping.

Question: Where do I get COLD-TEMPER Taps?

ANSWER: From your local Threadwell Tap distributor, who has been carefully selected to provide the same *personal attention* service we give every order at the factory.

Ask us to send you the name of the Threadwell *Cold-Temper* Tap Distributor nearest you, together with a complimentary copy of the Threadwell *Tap Book*, full of practical suggestions on how to cut better threads at lower cost.

DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA
EXPORT STOCKING DISTRIBUTORS
CANADA, Bridge Machinery Co., Montreal;
ENGLAND, Skylux Ltd., London and John H. Graham and Co., Inc.
THROUGHOUT THE WORLD

Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY · GREENFIELD, MASSACHUSETTS, U. S. A.

Season's Greetings

With War's end approaching and the blessings of Peace soon to be ours again, the coming Holiday season promises added joy and happiness for all of us.

To our customers and friends, we take this opportunity to extend our sincere Holiday Greetings with the earnest wish that they may enjoy a full measure of the season's gladness..made richer by realization of the assured victory which we have all fought and worked for so earnestly and unselfishly.

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

WHALE

WHALE BRAND

HY-FLEX

HACK SAW BLADES

Each Forsberg Blade that carries the famous WHALE BRAND mark of quality is scientifically heat treated to add the toughness that gives these Blades their fine performance. They're gauged and checked throughout every step of their manufacture and given a stiff bending pounds test before you get them for use. The popular HY-FLEX Blade, shown above, meets today's demand for a medium priced blade which is extremely flexible, yet has the guts for solid service.

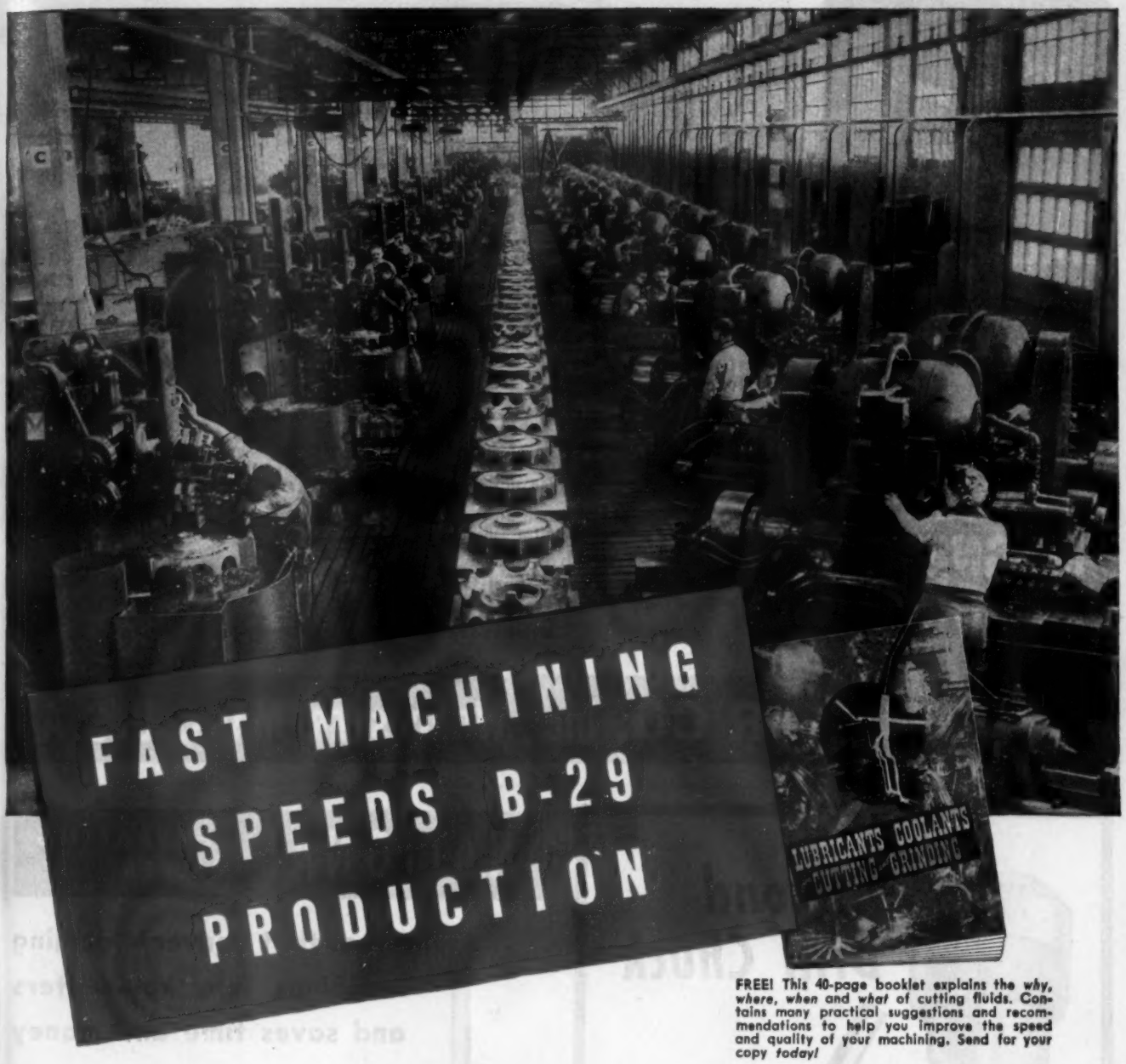
MO-HY

Here's a Whale of a Blade of a special analysis molybdenum, high speed steel that gives unusual cutting service. Can be used at the same cutting speeds as tungsten and deliver practically equal performance. If you want outstanding results on stubborn cutting jobs, ask your mill supply house for WHALE BRAND HY-FLEX and MO-HY BLADES and you'll get it.

Get to know the satisfaction in WHALE BRAND HACK SAW BLADES and FRAMES • BAND SAWS • COPING SAW FRAMES and BLADES • SCREW DRIVERS • HAND DRILLS. Ask for the catalog that describes these and other good FORSBERG TOOLS.

Forsberg

• MFG. CO., BRIDGEPORT, CONN., U.S.A.



FREE! This 40-page booklet explains the *why, where, when* and *what* of cutting fluids. Contains many practical suggestions and recommendations to help you improve the speed and quality of your machining. Send for your copy *today!*

THE aluminum crankcases being machined here are for 2200-hp, 18-cylinder aircraft engines . . . giant power plants that help B-29 Superfortresses carry heavier bomb loads faster and farther than any bombers ever built.

Turning out airplane engine parts and other precision war materiel on a mass production basis requires faster machining, better finish, longer tool life . . . assured by the use of Texaco Cutting and Soluble Oils. Texaco Cutting Oils lubricate the tools, carry away heat and prevent chip welding, thus lengthening tool life, assuring greater output.

The services of a Texaco Engineer specializing in cutting coolants are available to you through more than 2300 Texaco distributing points in the 48 States.

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

Another New Member of the

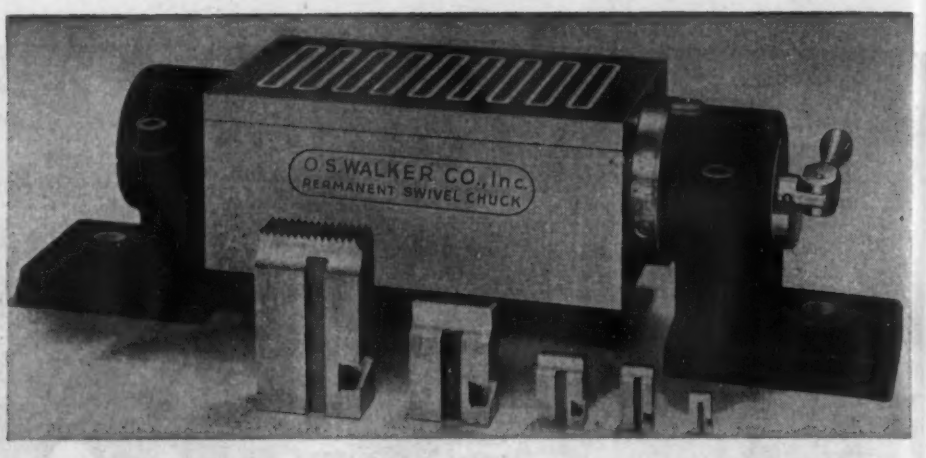
WALKER LINE

•

Swiveling Type

PERMANENT MAGNETIC CHUCK

•



These new Permanent Magnetic chucks—with 35% more holding power, greater effective magnetic area, are the result of Walker's many years specialization. Their greater holding power is retained indefinitely.

In the new Swivel Chucks, a graduated dial is provided for accurate setting at any point over a swiveling arc of 180°. With only 3/8" between pole divisions, the top plate is totally magnetic, thereby contributing to greatly increased holding power assured.

This new development—in response to the demand for a permanent magnetic chuck having all the features of an electro magnetic chuck—supplements the regular Walker line of Walker Magnetic Chucks.

Walker Permanent Magnetic Swivel Chucks are available for early shipment in three sizes: 4" x 8"; 6" x 18"; 8" x 24".

Write today for Descriptive Circular.

O. S. WALKER CO. Inc., WORCESTER, MASS., U. S. A.

Almond Drill Chuck

The Original Manufacturers of Drill Chucks

•

As Pioneers in their field, ALMOND THREE-JAW DRILL CHUCKS have played an important part in machine tool development. They were the first to be placed on the market more than seventy years ago.

Types and sizes are available to fit all machine tools and portable drills.

Write for complete information.

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U.S.A.

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from 1/2" to 3 1/2". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

When Jack hangs up his uniform —FOR GOOD...

IT'S been a long time since Jack made his last call as salesman for your *Industrial Supply Distributor! It may be a little while yet before Uncle Sam cancels his present contract . . . the one he signed way back when things weren't going so well for our side.

But after the V-Day excitement has all died down . . . after this war situation is finally settled for once and for all . . . you can be sure Jack will see that you receive the same efficient, courteous service as before.

In the meantime, your *Industrial Supply Distributor is doing everything in his power to take care of your needs both quickly and efficiently. It's not always easy to have just what you want in stock at the time you need it, so you can help him serve you better by ordering as far in advance as possible.

For equipment, materials and supplies, don't forget to . . .

Telephone your I S D* FIRST!

ARMY NAVY

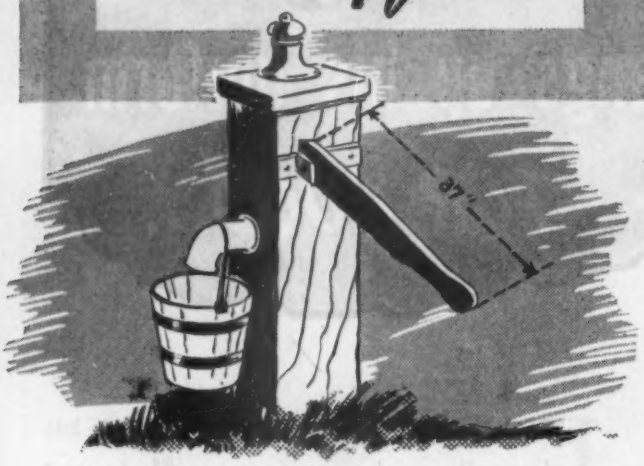
ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

80 THOMAS ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD. DETROIT · LONDON - E. P. BARRUS, LTD. - 30-36-37 UPPER THAMES ST. E.C.4

how to buy... *a cutting fluid*



• "It's hard to tell the depth of a well by the length of the handle on the pump"... and it's even harder to tell the real worth of a cutting fluid by appearances alone.

For instance:

Lower viscosity does not necessarily mean more effectiveness at the work area.

Dark oils are often cleaner than light-colored, clear-looking oils.

More total sulphur does not always mean better cutting quality.

Straight oils are often better refrigerants at the point of contact than soluble products.

Long dilutions often outperform oils used straight.

The wise buyer measures cutting fluids by how they perform on the machine. To find the best performing oil for his needs, he looks to experience.

D. A. Stuart Oil Co., specialists in industrial oils since 1865, share their experience with thousands of such wise buyers. They stand ready to do the same for you.

WRITE FOR YOUR COPY

of the *New* Stuart 60 page handbook: "Cutting Fluids For Better Machining." It is full of data—information that you will find a helpful guide to the most efficient use of cutting fluids. It is free to executives and engineers.

D.A. Stuart Oil CO.
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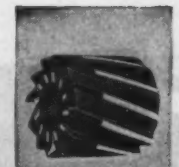

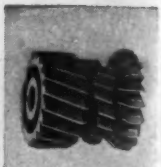

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Your plant and our plant are working full blast to end this war quick! But we don't want to win the war and lose the peace.

You and A.C.E. can get together—NOW—on your future tooling plans. You can consult with our Engineering Department on future tooling needs, so that you can have your Hi-Speed or Carbide-Tipped Cutting Tools ready at the earliest possible moment.

In this way you can be sure to get back into civilian production as fast as permissible.

We have appointed a special division of A.C.E. Engineering Department to look after your reconversion plans. Write us today.

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HI-SPEED OR CARBIDE-TIPPED

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If there were decorations for industrial heroes, Mr. Dag would be a much be-ribboned gentleman. Perhaps we should call him 'Captain' Dag, because he commands so versatile a company of physical and chemical properties.

Captain Dag (a campaigner who will never be mustered out) represents Dag brand colloidal graphite, the smooth, black liquid concentrate which serves so many different war industries. Capt. Dag may take the form of a dry film, a fluid film, a surface coating, an impregnation, etc.

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1. Slippery—A Good Lubricant. Softer than Talc
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3. Withstands Temperature Extremes
4. Absorbs, Radiates and Conducts Heat
5. Maximum Purity
6. Low Coefficient of Expansion
7. Particles Bear Like Electric Charges
8. Insoluble in Acids and Alkalies
9. Black and Opaque
10. Gas Adsorbent
11. Little Photoelectric Effect
12. Miscible with Most Fluids
13. Films Adhere Tenaciously and Dry with Sharp Edges
14. Microscopically Fine Particles. Penetrates Fine Pores
15. An Excellent Suspension

1 3 8 14 13 6

1, 3, 8, 14, 13, 6

CITATION: "We have been enthusiastic users of Dag colloidal graphite for more than ten years. We find it the only material which will prevent bolts, nuts and flanges from seizing under the high temperature and pressure conditions in our boilers and steam systems."

1 3 13 14

1, 3, 13, 14

CITATION: "Dry films formed from Dag colloidal graphite supply durable lubrication on parts which could not be effectively lubricated otherwise. Such films are functioning at temperatures from (—60° F. to +1200° F.) and higher."

2 4 13 10 11 3

2, 4, 13, 10, 11, 3

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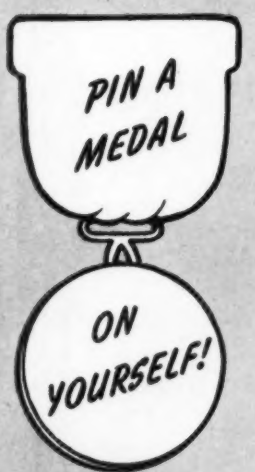

For easy reference we've given colors to Captain Dag's most valuable properties. Match these colors with the performance "citations" above. Then pin a medal on yourself for putting Captain Dag to work in your plant. He's one campaigner who won't be mustered out.

Dag, Oildag, Aquadag, Castordag, Glydag and Prodag are registered trade marks of Acheson Colloids Corporation. Copr. 1944 by Acheson Colloids Corp.

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PORT HURON, MICHIGAN

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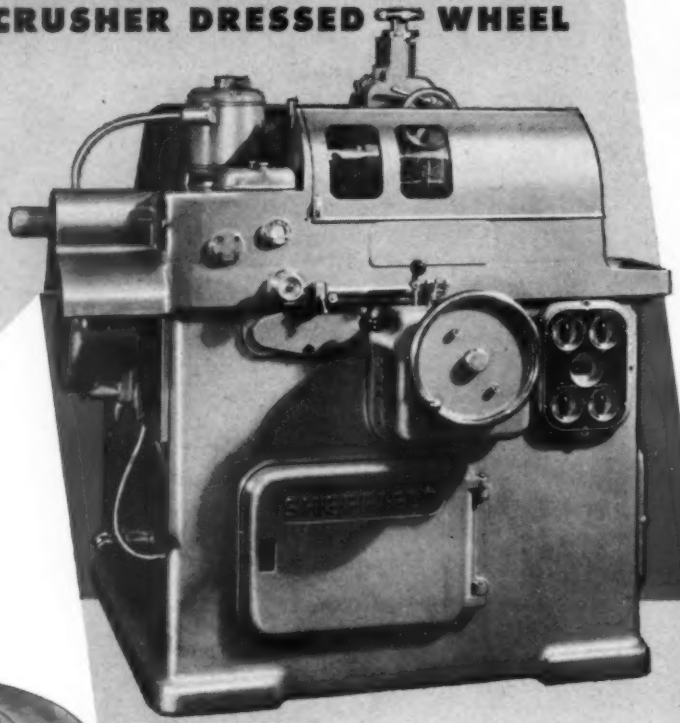
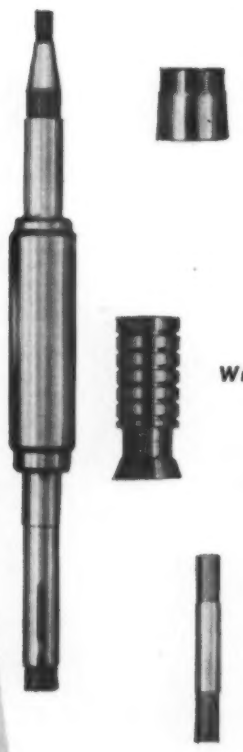
PLUNGE GROUND

WITH CRUSHER DRESSED WHEEL





The crusher dressed multi-ribbed grinding wheel offers important savings in both time and production costs in grinding precision threads and circular form or profile work.

In a plunge cut with such a wheel on the Sheffield Thread and Form Grinder, a single or multi-start threaded section, the length of which does not exceed the thickness of the wheel, is completed in 1-⅓ revolutions of the work part. For larger parts traverse grinding is used.

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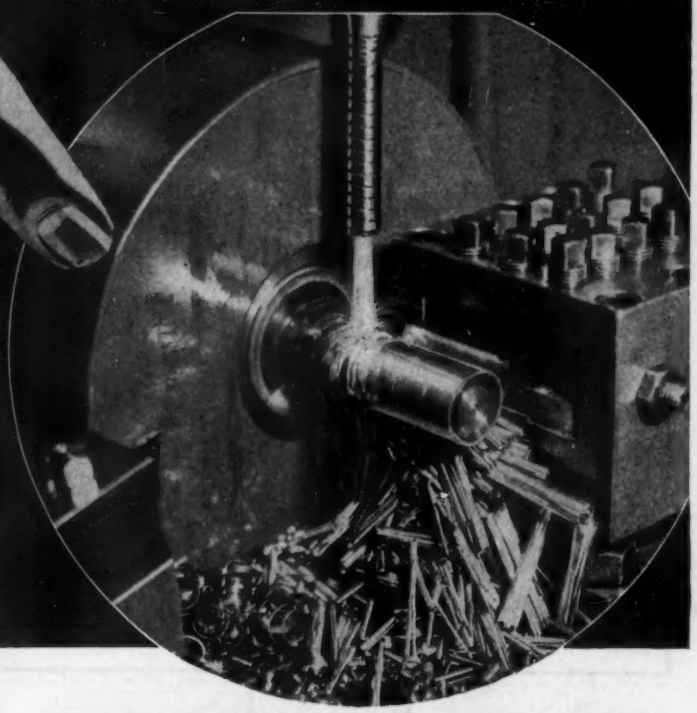

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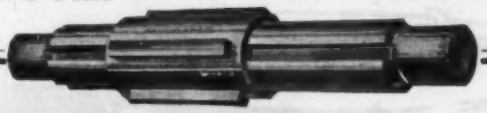

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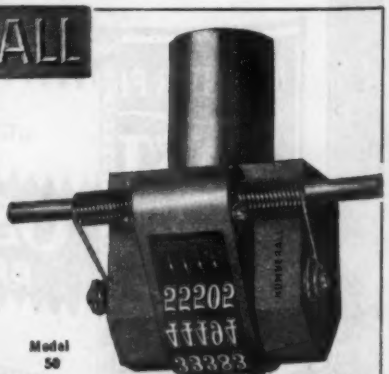

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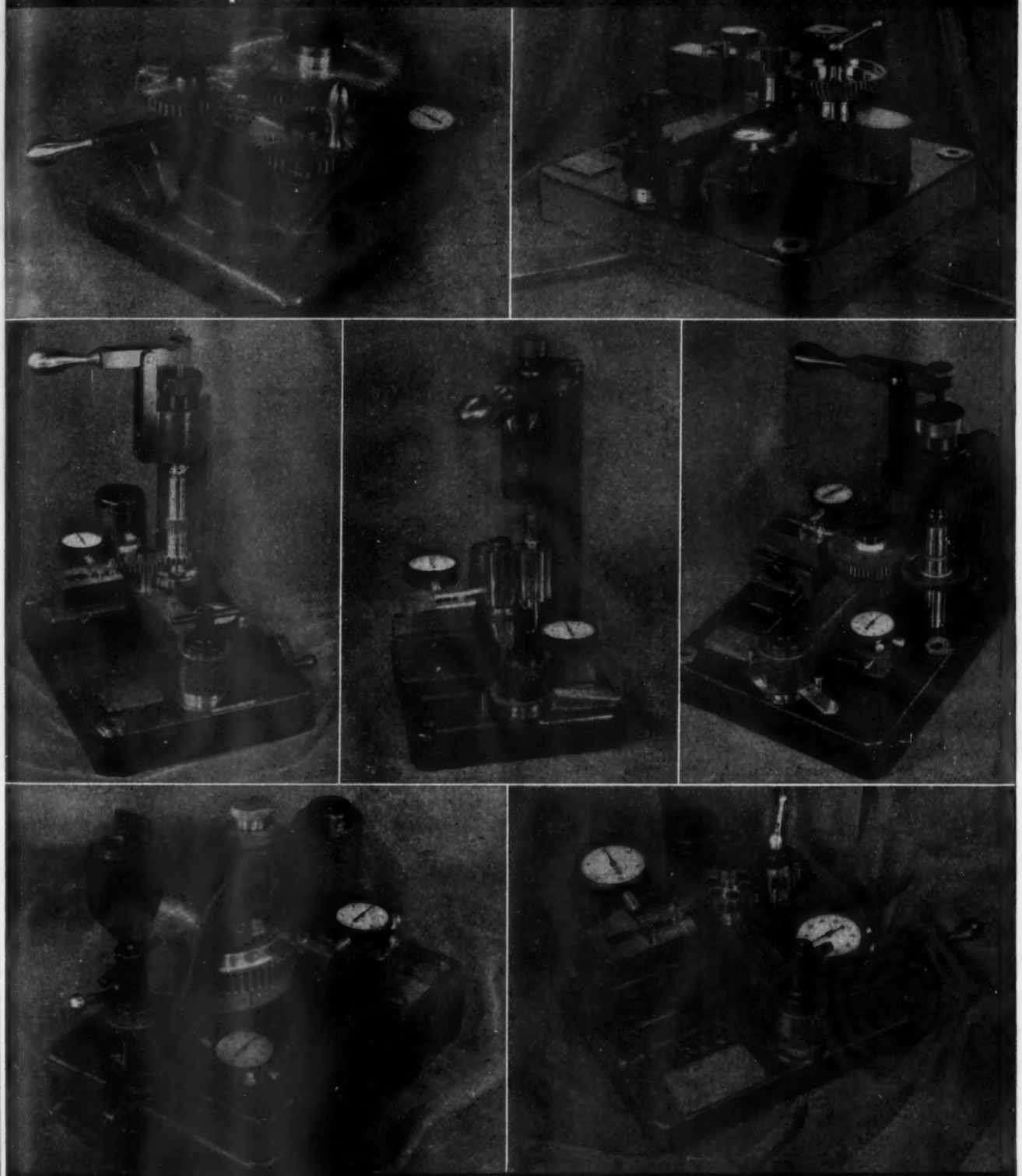

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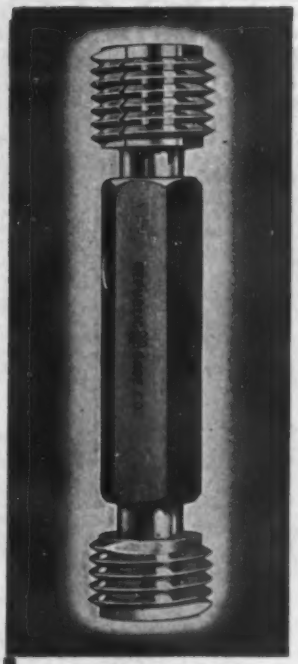

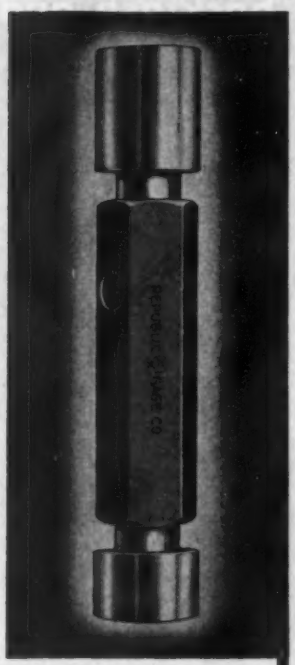

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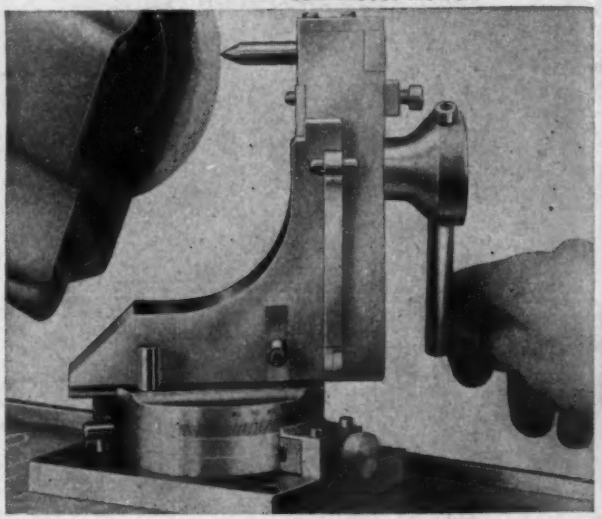

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Tru-Thread Diamond Tools employ a radically new principle, applied for the first time by Wheel Trueing engineers, and utilize the hard characteristics of a diamond of a shape never before used for such a purpose.

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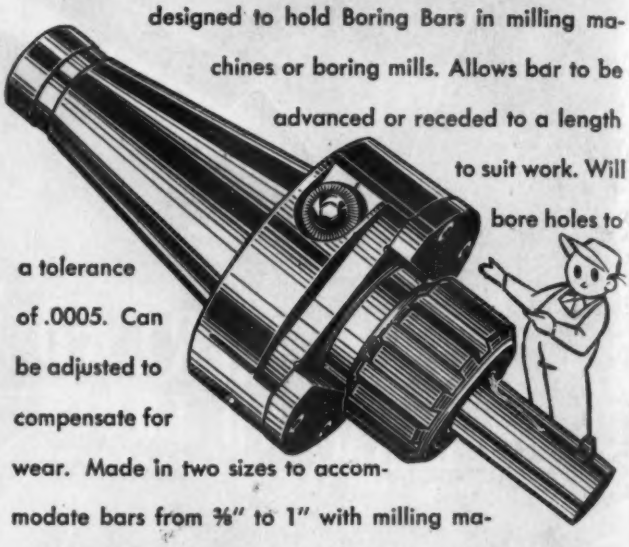

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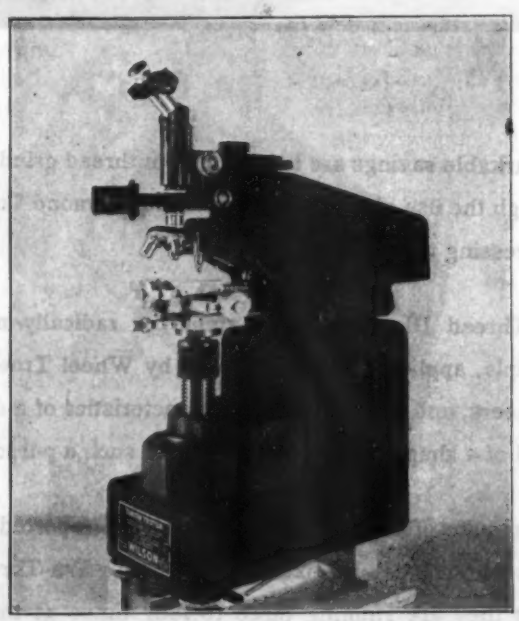

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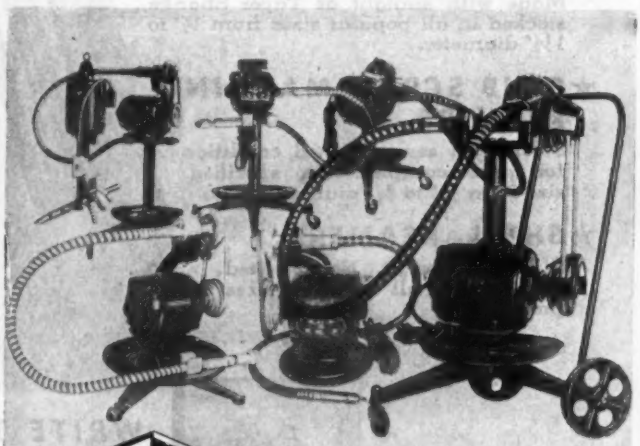

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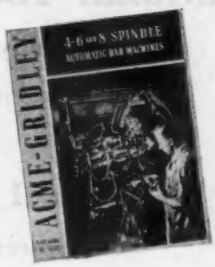

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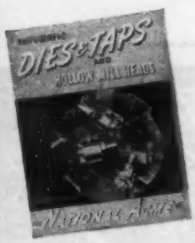

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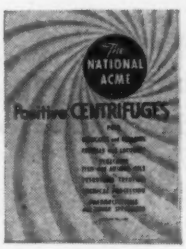

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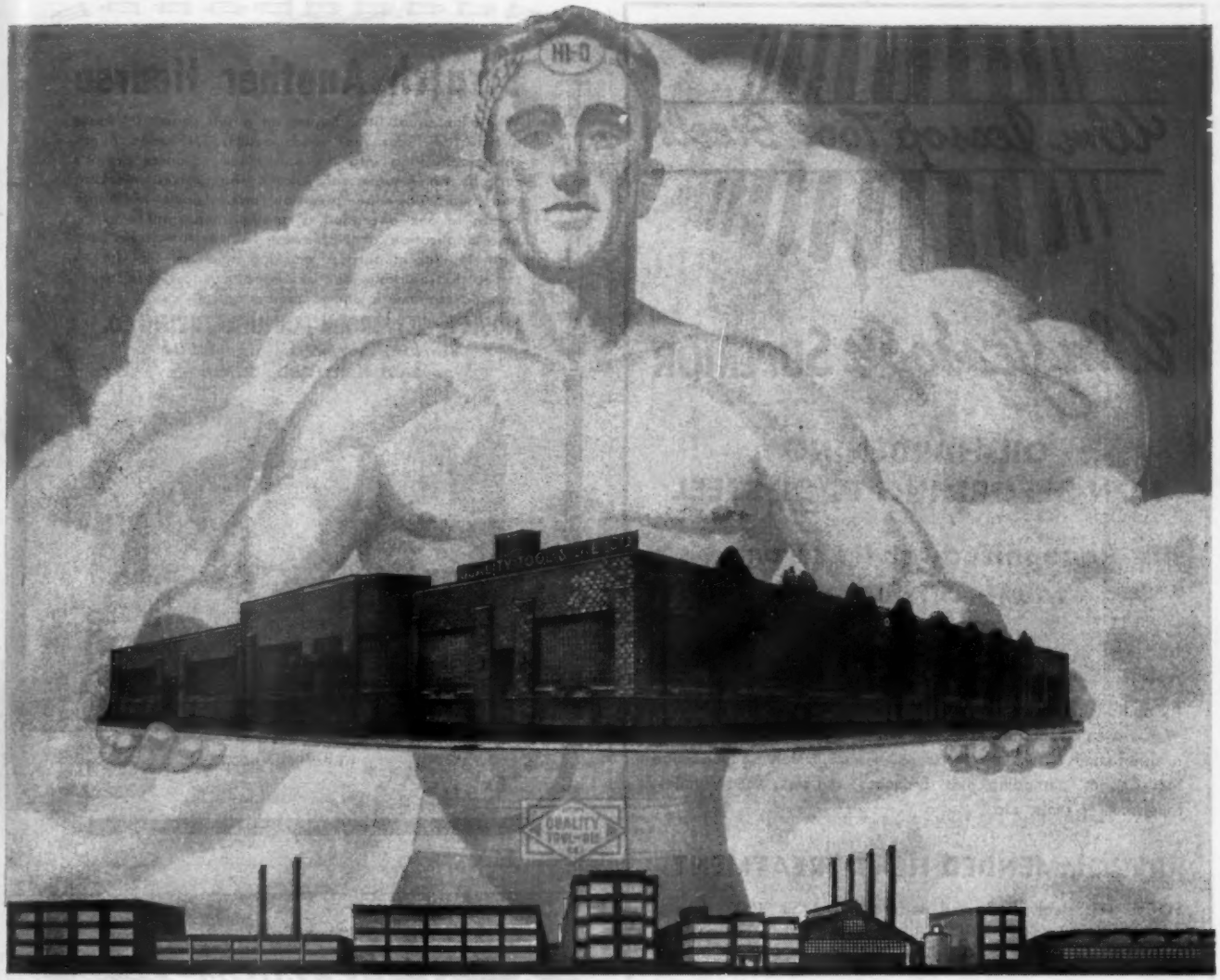

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Symbol of the Spirit of the Quality Tool & Die Co.

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Backing up these ideals, there is a Spirit at the Quality Tool & Die Company. . . A spirit of pride in jobs well done . . . A spirit of adventurous pioneering of new and better methods . . . A spirit which means that any job and every job that we do for you must be to YOUR entire satisfaction. These ideals and this Spirit are well known to our customers. They frequently comment on this because it all works to their advantage.

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HARDENING: Heat carefully to 1425-1475° F. and when uniform temperature is attained, quench in thin oil the temperature of which should not be less than 90° F.

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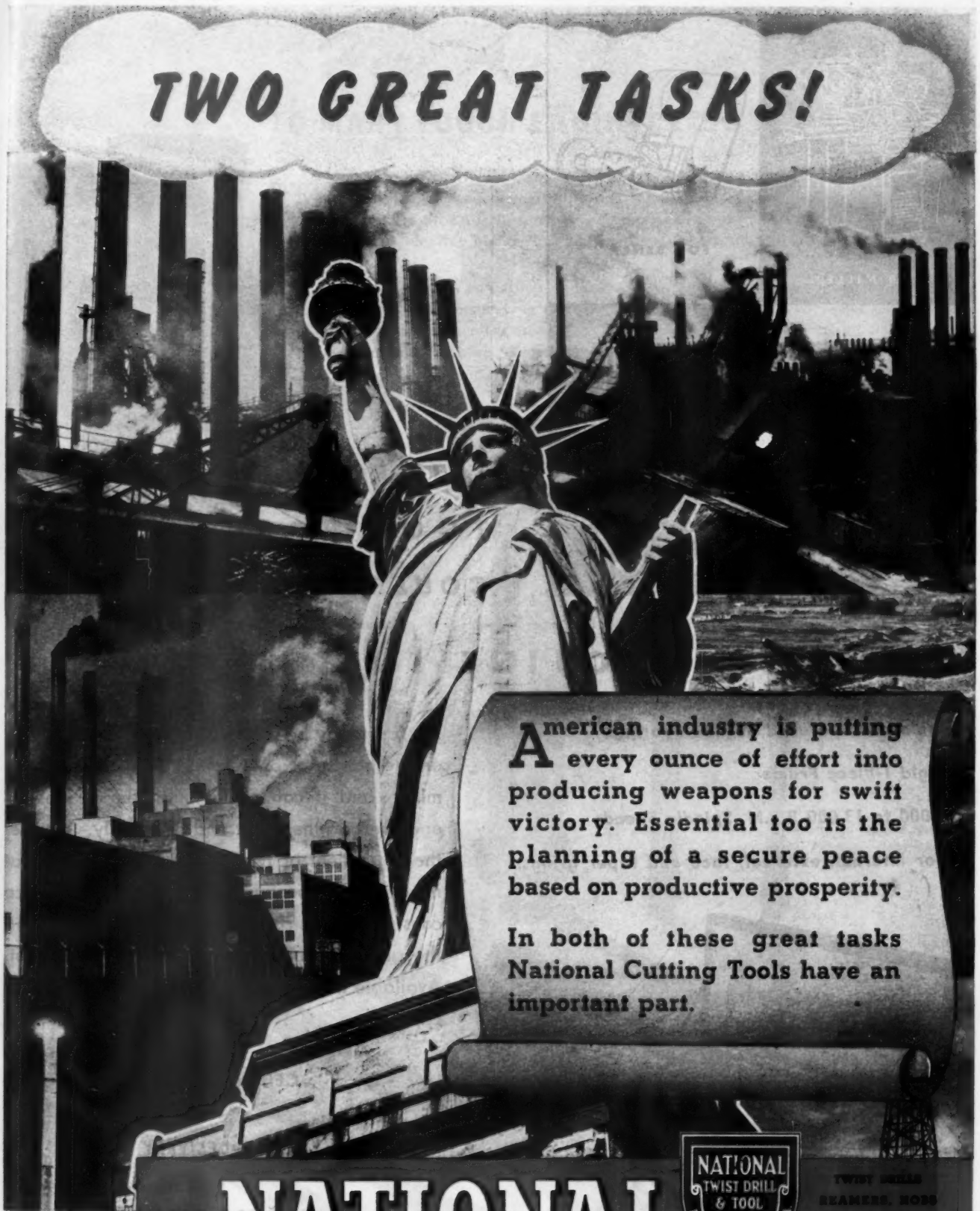

American industry is putting every ounce of effort into producing weapons for swift victory. Essential too is the planning of a secure peace based on productive prosperity.

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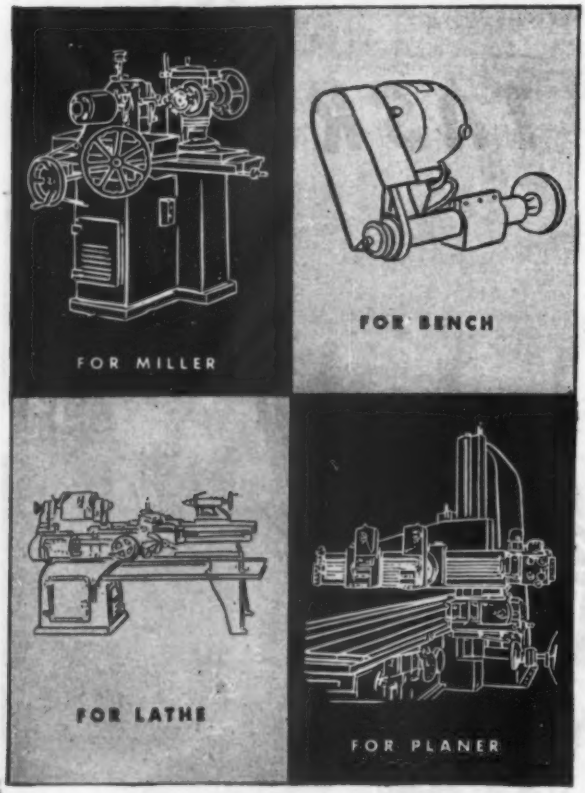

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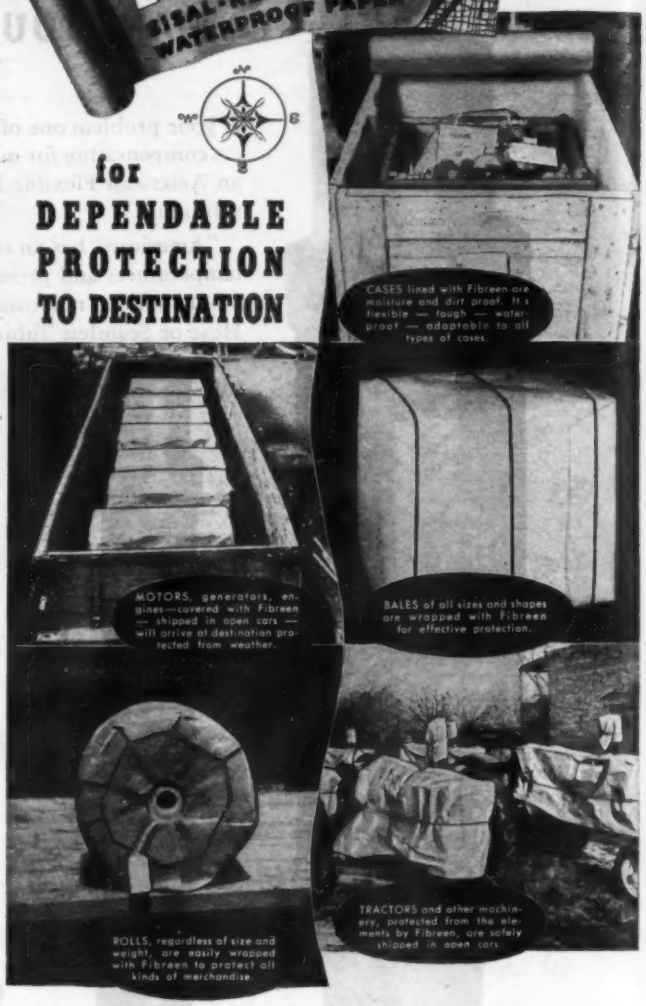
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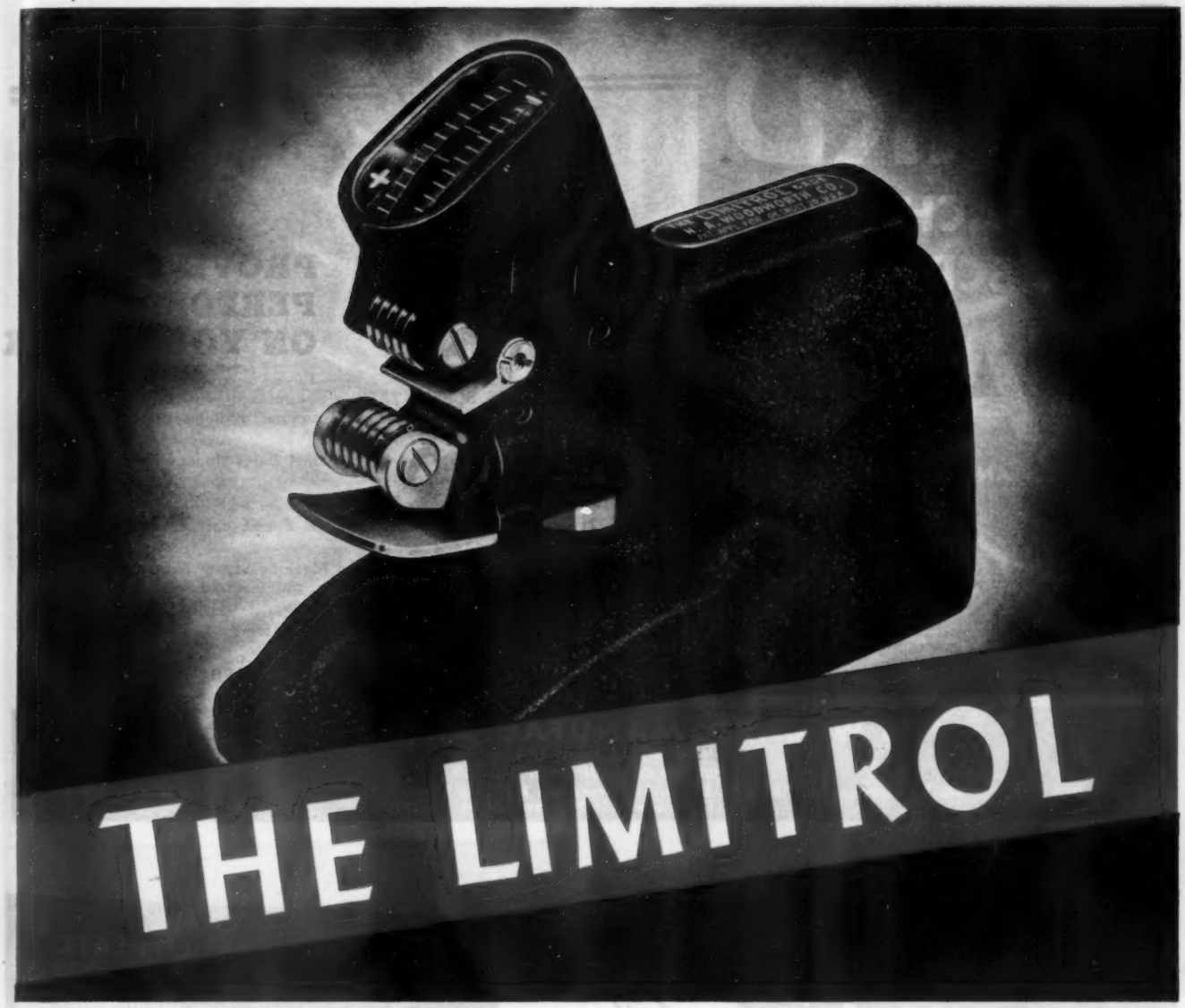

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The long life and economy of Card Machine Screw Taps are quickly proved in every day use. Buy them, put them to work and you'll be convinced of their better performance.

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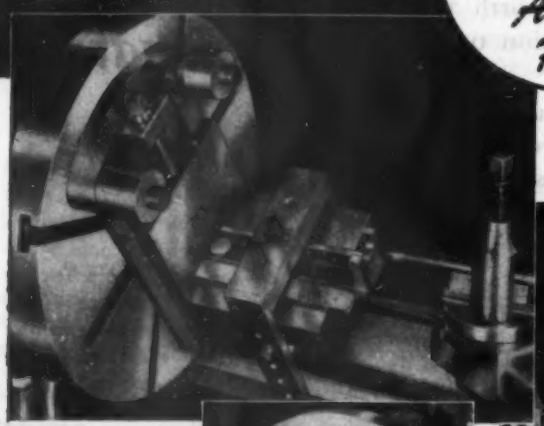
No. 51 Lathe Angle Plate

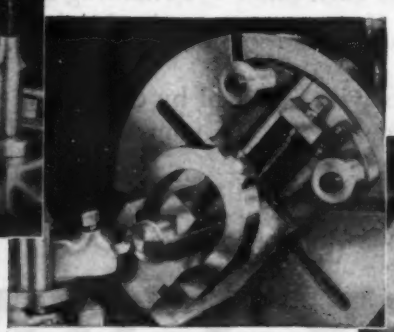
NO. 51 LATHE ANGLE PLATE

enables your shop to turn out work samples or short or long production runs without building jigs or fixtures



No. 51 — Complete with straight adjustable clamp. Equipped with centering gauge with provisions for counter-balances. Shown boring offset radius.

No. 51-A—Multi-use accessory for Lathe Angle Plate, especially for offset angle boring and turning. Can be indexed to 12 divisions.



No. 51-B—Lathe angle plate is shown with accessory B turning an eccentric.

For Off-Centre and Compound Angle Lathe Operations

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No. 51-C—Shown with work holder C, the Lathe Angle Plate is shown finish-boring a die plate.

BEST TOOLS CORPORATION

ROCKVILLE CENTER, LONG ISLAND, N. Y.

BTC

"WITH **Gulf Cut-Aid**

WE INCREASED PRODUCTION ON THIS MILLER **10%**

——TOOL LIFE **50%**

—says this Superintendent

(Left) Close-up of straddle milling operation on fins for impellers of geared aircraft superchargers. Tolerance on the sides of the fins is critical as to finish and dimensions. (Right) Actual photo of a Gulf Service Engineer consulting with Superintendent on results secured with Gulf Cut-Aid on this precision machining job.

GULF CUT-AID PROVED SUPERIOR to 12 other brands of cutting oil we tested for straddle milling aluminum alloy supercharger impellers," says this Superintendent. "With this revolutionary new cutting oil, we get 10% greater production and 50% longer tool life than with the cutting fluid we used previously."

This is one of hundreds of war plants that have increased production and tool life on precision work by using the proper Gulf Cutting Oil for each particular job requirement.

Gulf performance-proven cutting oils have established records on the toughest steels and most punishing schedules that the armament and aircraft industries offer. You'll find them helpful in improving production and tool life now and in paring costs below competitive levels in the postwar period.

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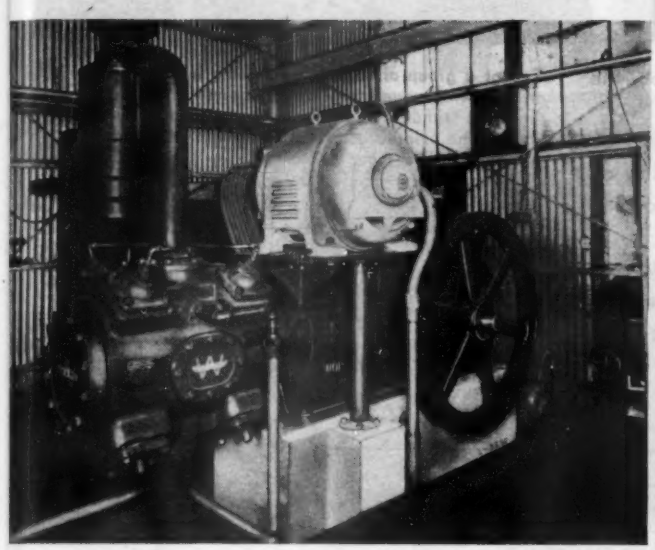

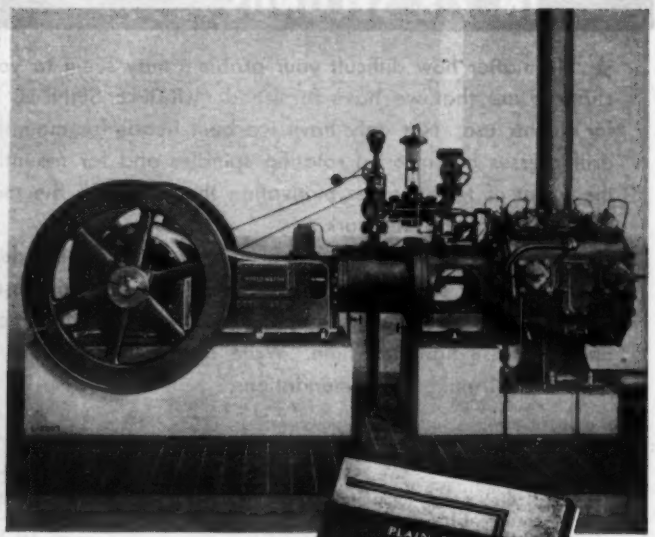

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"Plain Talks on Air and Gas Compressors" — a series of articles by Worthington engineers — will give you an idea of how thoroughly we are prepared to discuss with you the technical problems relating to your plant's present or future investment in compressors.

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"Plain Talks" also illustrate the straight-forward engineering approach that has consistently advanced Worthington compressor design for more than 40 years.

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Operation is automatic. Just oil a Worthington Compressor and start it . . . you'll get automatic operation, requiring a minimum of attention.

To get this kind of long, trouble-free Compressor service, call in a Worthington engineer to discuss *your* compressor needs. Write for "Plain Talks".

Worthington Pump and Machinery Corporation, Publications Department, Harrison, N. J.

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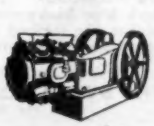

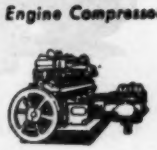

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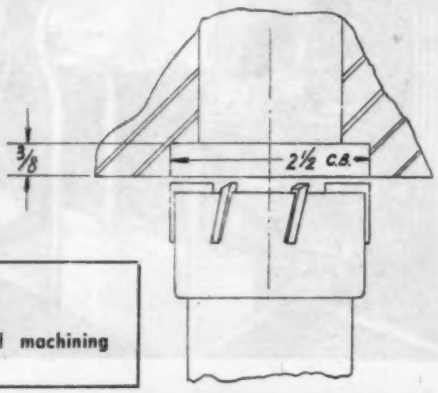
Counterbore

24 . . . 2½" DIA. HOLES IN 7.8 SECONDS . . . . .

★ No matter how difficult your problem may seem to you, the chances are that we have furnished MULTIPLE SPINDLE Heads for similar use. Not only have we built heads for mounting on drill presses but also on rotating spindles and for mounting on the turret of turret lathes motivating them through the machine spindle containing the work.

Hoefer Heads not only increase production per hour but decrease cost of drilling or allied operations . . . also they increase production from the same floor space (no new machinery needed) and decrease handling time. Write and tell us of your needs and we will make recommendations.

Two of a group of twelve two-spindle milling heads arranged for mounting of counterboring milling cutters, with standard key drive for counterboring Track Links. The spindle construction is that of standard milling machine type.



Counterboring Track Links

2½" dia. x ⅜" deep holes. Speed, 40' per minute—61 r.p.m.
6 tooth cutter cuts .048" per revolution

2.928' penetration per minute
⅜" depth—7.8 seconds actual machining time for both counterbores.

Hoefer's Whole Business is Holes . . . . **HOEFER MFG. CO.** *Freeport, Ill.*

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Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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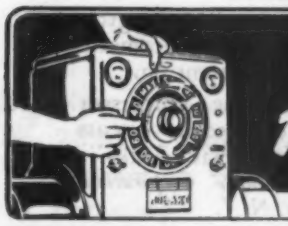

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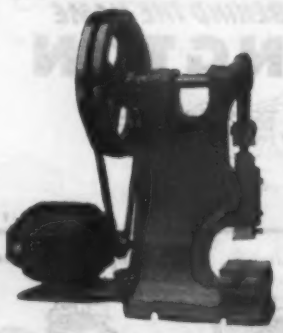
H. & H. HIGH SPEED SAFETY CLUTCH BENCH PRESS for Small Metal Stampings



Save money on die construction by using this High Speed, inexpensive press instead of large expensive presses. Large throat permits use of a sub press unit.

Ram stroke ⅞" — Adjustable ram.

Depth of throat 5"—

Capacity 2½ ton.

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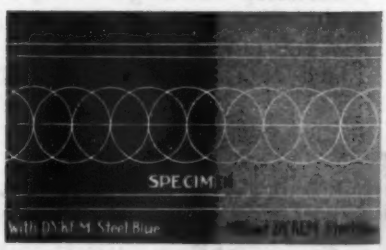
STOPS LOSSES

making dies & templates



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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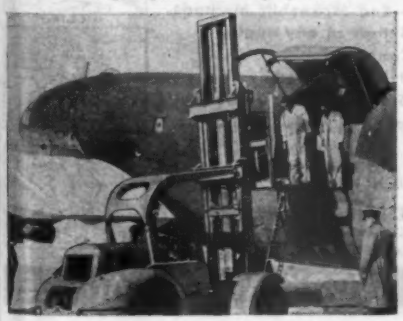
Hyster "75" Lift Truck (7,500 lbs. capacity) handling materials in a manufacturing plant.

Pioneers in Materials Handling Equipment

Hyster "20" Lift Truck (2,000 lbs. capacity) handling barrels of rosin.

• • •

Hyster "150" Lift Truck (15,000 lbs. capacity) loading shipment on cargo plane.



Hyster is the name of a comple line of materials handling equipment.

Hyster lift trucks and straddle trucks are gas powered and equipped with pneumatic tires. From the Model 20 Lift Truck (2,000 pounds capacity) to the Straddle Truck (30,000 pounds capacity) Hyster can hoist, move, stack, transport over rough surfaces or smooth city streets.

The word "Hyster" means to hoist. Hyster is an *action* name for *action* products. Hyster is a good name to remember—a good product to use to cut the high costs of materials handling.

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Portland 8, Ore., U.S.A.

World's largest maker of tractor winches. Sales and service offices in principal world cities.

Hyster Straddle Truck (30,000 lbs. capacity) handling lumber.

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Hyster Karry Krane (10,000 lbs. capacity) handling "Caterpillar" tractor tracks.

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Stow Flexible Shaft connected to belt-driven pulley for heavy-duty grinding.

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It's easier, faster, cheaper—and safer by far—to move the tool instead of the work. Especially when you're grinding, sanding, drilling, filing or buffing heavy and unwieldly parts; that's why Stow Flexible-Shaft Mobile Power Units have paid their way many times over—in fabricating shops, assembly lines, foundries, welderies, tool and machine shops.

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PROFILING *TWO* ORIFICES

Of IRREGULAR SHAPE
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SIX Operations Completed on ONE Machine in 40 Min.,* Floor to Floor

Gorton Tracer-Control Duplicating provides a simple, fast and accurate means for machining irregular shapes in parts like this Bronze Recoil sleeve shown above. Specifications for this job called for an orifice on opposite sides of the sleeve.

Both orifices required a rough, semi-finish and finish cut—the latter with a 1/4" diameter end mill to produce 1/8" radii at the two corners. Only one set-up is necessary to complete the six operations (3 cuts around each of two orifices) accomplished with a high degree of uniform accuracy, in 40 minutes, floor-to-floor time.*

The simplicity of Tracer-Controlled operation permits even the most difficult work to be accomplished by inexperienced help.

*NOTE—Time greatly reduced in other plants by using a battery of six or more Gorton Duplicators in multiples of three (1 for each cut) eliminating ALL cutter changes.

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Material—Bronze.

Cutters—(only 3 needed)—Four-flute, fast spiral end mill, 7/16" diameter, two End Mills, 3/8" and 1/4" diameter.

Speed—1900 r.p.m.

Feed—Manual.

Production—40 minutes per sleeve.

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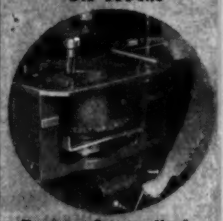

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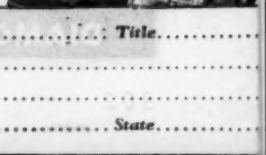

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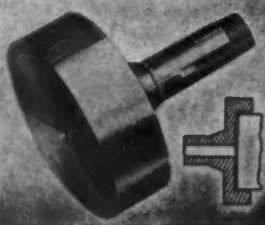

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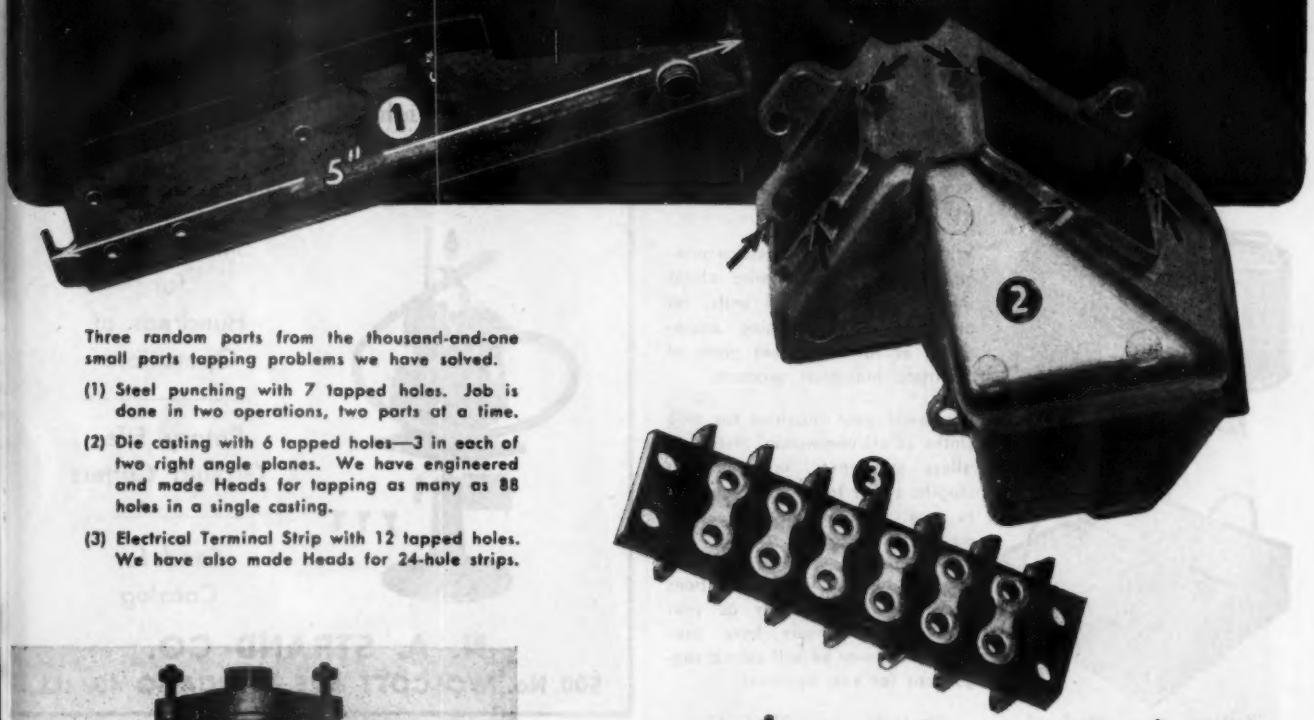
THE FAST, LOW-COST WAY TO TAP SMALL PARTS - - - like these - - - -



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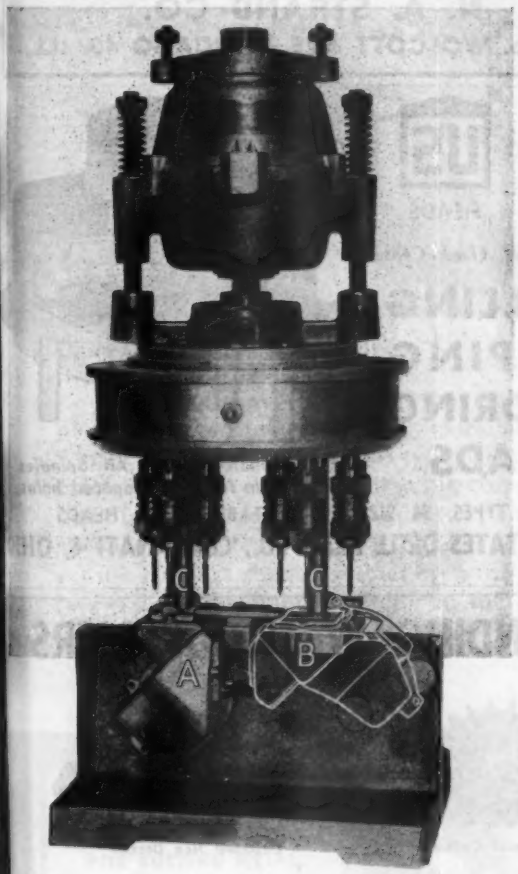

This is the complete Head for part 2 above. Parts are progressively fed from position A to B, three holes being tapped at each position, at the same time, in two different planes. Parts are simply laid over horns and are automatically positioned and held in place by locators C, C, when spindles are fed. Simple, fast and fool-proof.

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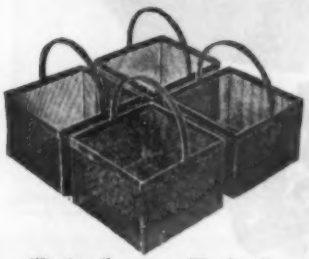

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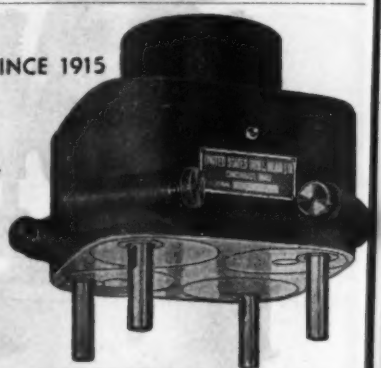

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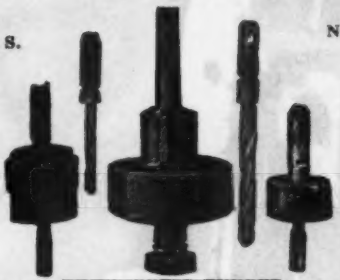

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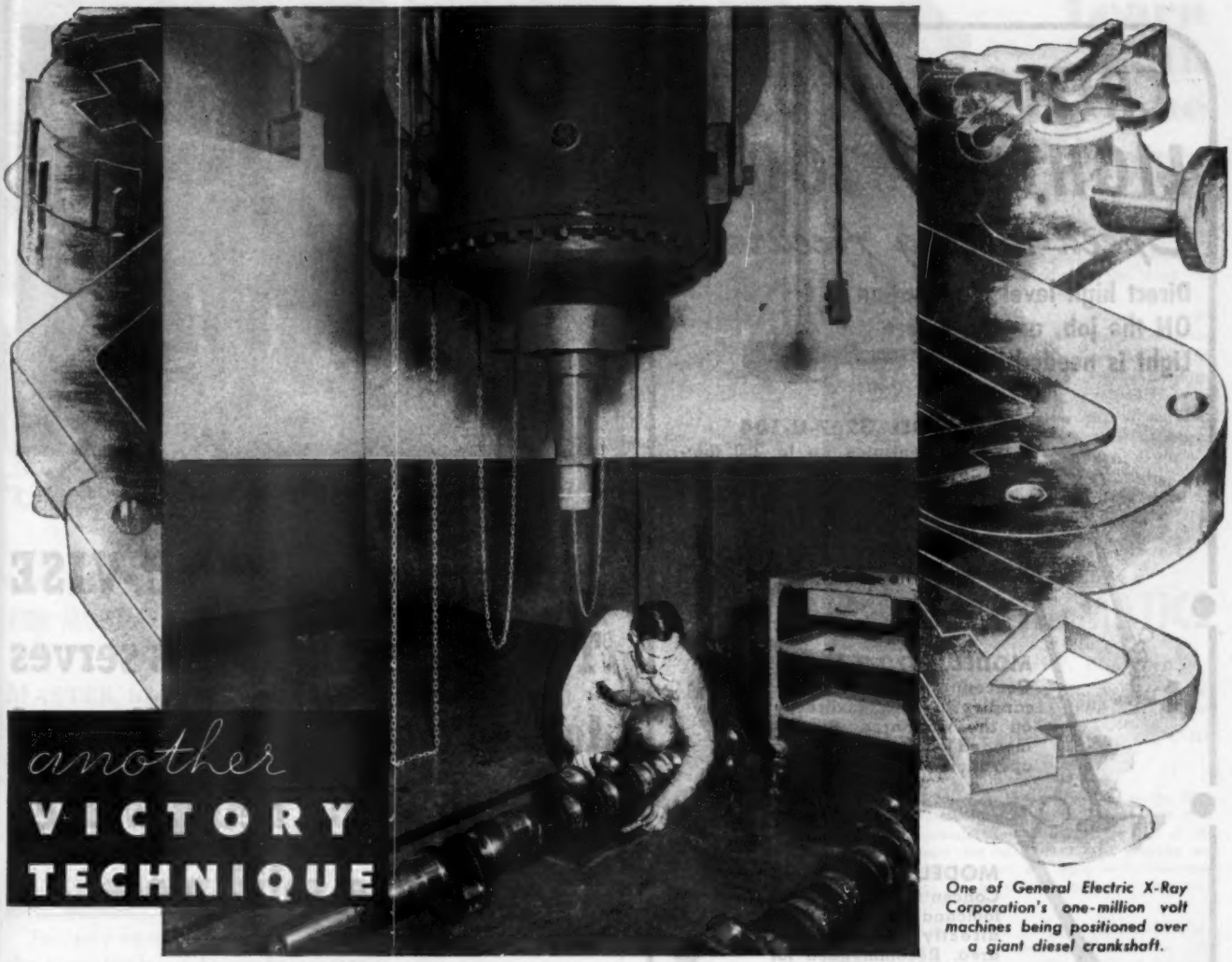

One of General Electric X-Ray Corporation's one-million volt machines being positioned over a giant diesel crankshaft.

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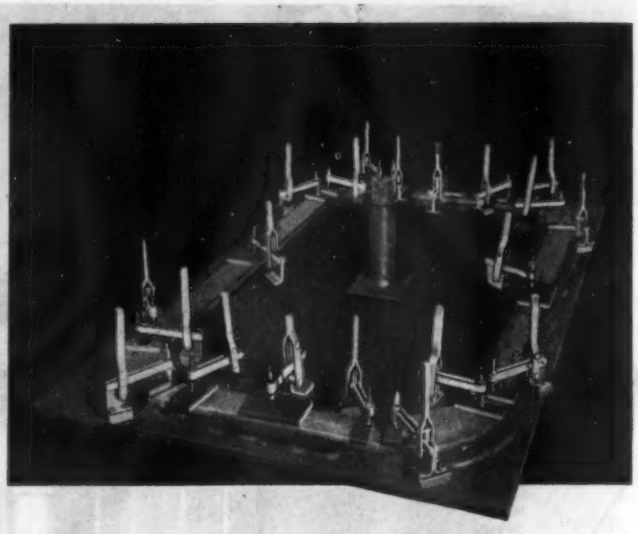

How a group of KNU-VISE Toggle-Action Clamps serves to hold eight sections of metal together while being welded into one solid piece.

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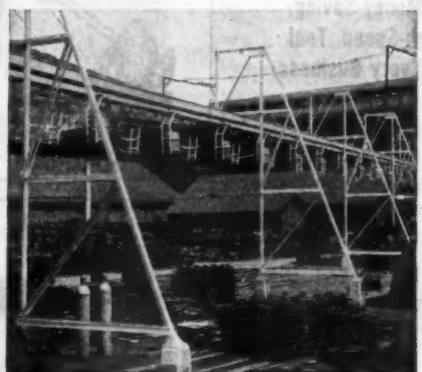

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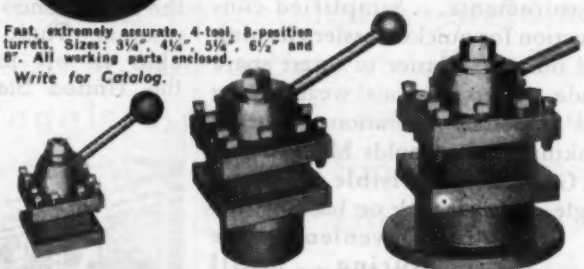

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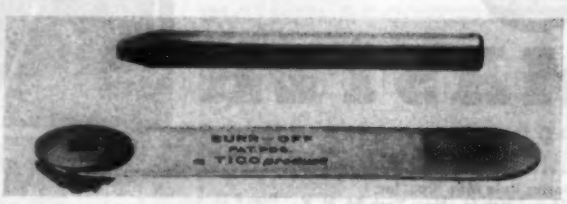

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Sapphire outwears steel 100 to 1!

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Famous for

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Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 288 Nov. 25, '44, American Machinist

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RUST PREVENTION IS ESSENTIAL

RU-PRE-SOL gives you safe protection against rust and corrosion on all metal working operations, during transportation and long time storage.

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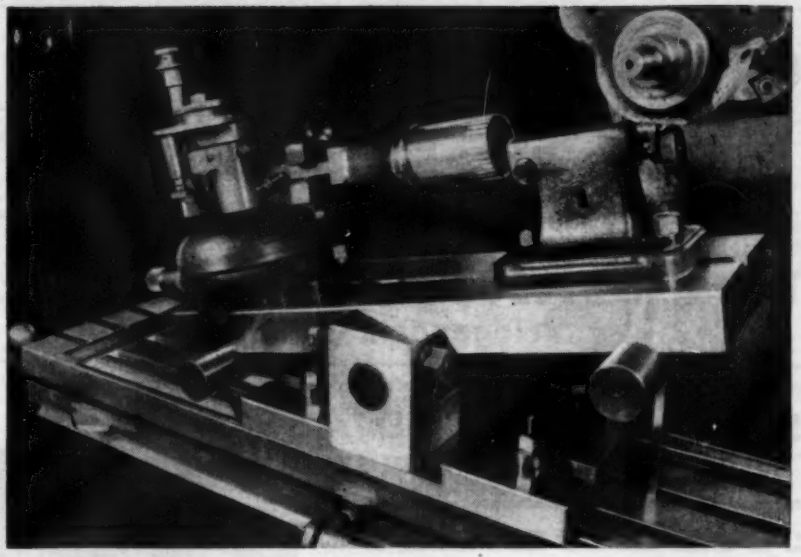

View showing index head and center mounted on this fixture for milling slots in cylinder at a multiplicity of angles. This set-up eliminates the necessity of making special riser blocks to mount index centers

ORDNANCE GAUGE CO. 4080 Frankford Ave., Philadelphia 24, Pa.

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1 DOUBLE-QUICK OPERATION!

ONCE IN AND OUT.. THE BURR IS GONE

REMOVES BURRS FROM INSIDE AND OUTSIDE EDGES IN ONE OPERATION!

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Used wherever collets are standard equipment. Ideal for turning bar stock, facing off and second operation turning. Can be mounted on any lathe, grinder or rotating spindle; can be loaded and unloaded while machine is running; operating independently of spindle rotation, can be mounted on face plate and be indicated to run dead true regardless of spindle run-out. *Collet does not move;* face-off and length dimensions on second operation work can be held to close limits. 1" and 2" sizes. *Get our illustrated Bulletin "A".*

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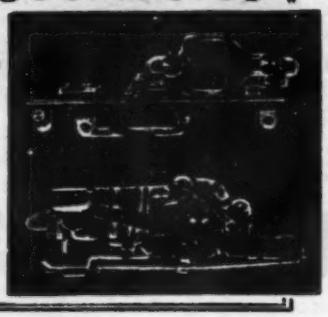

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P-997, AMERICAN MACHINIST
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Excellent opportunity for post war future.

We are a long established company and have no reconversion problems.

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Please give full particulars as to age, experience, etc. Correspondence confidential. Address

P-105, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

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SUPERINTENDENT: Well established heavy industry making equipment for cutting and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Statement of availability required. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

ASSISTANT SUPERINTENDENT. Graduate M.E. Thoroughly familiar machine shop operations in pump production. Give fully age, experience, references, salary expected. P-113, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

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WANTED

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Graduate engineer or equivalent, experienced in the design and development of special and experimental machines. Men with creative ability required, experienced in such lines as automatic, semi-automatic, or ordnance equipment. Must be thoroughly acquainted with modern methods and shop practices and capable of developing new ideas in conjunction with modern mechanical laboratory facilities.

State age, marital status, details of education, experience, draft status, present salary and salary expected. Enclose recent photograph or snapshot.

Post-war opportunity.

Applicants must be able to obtain Statement of Availability.

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Personnel Division
Wilmington 98, Delaware

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P-108, AMERICAN MACHINIST
330 West 42nd Street New York 18, N. Y.

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MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions in New England.

Only men 35-55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview.

P-940, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

(ADDITIONAL EMPLOYMENT ADS ON PAGE 318)

SEARCHLIGHT SECTION

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Experienced in manufacture of small quantity—high precision mechanical devices. Must have proven ability to run such a plant with costs low enough to compete with most successful in the industry.

P-107, American Machinist
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Durant Manufacturing Company
Box 748
MILWAUKEE 1, WISCONSIN

EMPLOYMENT SERVICE
(Continued from page 317)

SALARIED POSITIONS—This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

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SALES ENGINEER with proven sales record selling to metal working and metal processing industries of Southern Califorina past three years, will build present and post-war business for you in Los Angeles area. Large acquaintance aircraft, machine shop, shipbuilding, foundry, heat treating, welding and plating industries. Some metallurgical experience. Capable handling advertising as well as sales. Drawing account and commission basis. Dudley V. Cassard, 12239 Falkirk Lane, Los Angeles 24, Calif.

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PROVEN PRODUCT. Will sell or lease to manufacture and market patented automatic units for drilling, boring, milling and tapping. These units completely engineered up to date for production and have been fully proven in service with large number of users. Patterns, jigs, fixtures available. Unlimited post-war possibility for sales to automotive industry, domestic appliance and agricultural machinery manufacturers. BO-117, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite, 453, 815-15th St., N.W. Washington 5, D.C.

WANTED

THE HOOVEN, Owens, Rentschler Co. and The Niles Tool Works Co., Divisions of General Machinery Corporation, would like to obtain copies of its very old catalogs—those published fifty years ago and earlier. Anyone having copies please write to General Machinery Corporation, Hamilton, Ohio, giving description, date of issue, and condition.

TOOL DESIGNER

Active Midwest tool company wants experienced man immediately and for post-war work to design carbide cutting tools and dies. Salary open. Address reply to

P-999, American Machinist
330 W. 42nd St., New York 18, N. Y.

WANTED

Engineer, mechanical, to take full charge of development work on small gear type pumps. Excellent post-war opportunity and good working conditions with progressive organization.

WARD MACHINE COMPANY, INC.
966 Main St. Brockton 64, Mass.

(Position Wanted)
PRACTICAL MAN

Experienced in designing and supervising manufacture of dies, tools, and machinery for light mass production. Knows how to get willing cooperation all down the line. No college, but broad practical experience, and plenty of good workable ideas. Now in charge of small plant with excellent production record. Wants supervision of plant or engineering department with progressive firm. Minimum salary $10,000.

PW-106, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

EXECUTIVE

I was a machinist, then toolmaker, tool and machine designer, foreman, superintendent, and now chief engineer. Wide experience in various phases of manufacturing. Good education. Sixteen years with present employer. Seeking broader opportunities. Factory management preferred. Minimum salary considered $12,000 per year.

PW-112, American Machinist
330 W. 42nd St., New York 18, N. Y.

SALES ENGINEER
Available

Desires connection with well established, progressive company whose product must be sold by a technically trained man who is a real producer as a salesman and who must also possess a thoro knowledge of all phases of design, processing and fabricating in the metal trades. Past experience includes five years of successful sales and sales promotion work, and fifteen years in capacities of Chief Production Engineer, Shop Superintendent, Plant Layout Engineer, Tool & Process Engineer. Served apprenticeship as machinist. Married, 41 years of age. Will locate anywhere, either foreign or domestic. Conversant with German and French languages. Now employed. Present contract expiring. W.M.C. statement of availability. Answer

SA-118, American Machinist
330 W. 42nd St., New York 18, N. Y.

WANTED
A TOOL ENGINEER AND A TOOL DESIGNER

Large metal stamping and forging company now doing war work and having extensive postwar program, is interested in securing the services of a reliable Tool Engineer and a Tool Designer.
Men selected must be thoroughly familiar with die designs, layouts, and plant operations.
Excellent opportunity for right persons, salary commensurate with ability.
All replies will be held in strictest confidence.
Must comply with W.M.C. regulations.

P-109, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED
PRODUCTS OR INVENTIONS FOR POST-WAR MANUFACTURE

We will purchase outright or manufacture on a royalty basis, household, automotive, tools, or any specialty of recognized merit. We are a well organized and equipped metal working company. Write giving details of your product or item. Address

BO-953, AMERICAN MACHINIST
520 North Michigan Ave.
Chicago 11, Ill.

A MODERN EQUIPPED MACHINE TOOL PLANT
IN BRIDGEPORT, CONN.

Real Estate, Equipment and Business for sale. Founded in 1928; approximately 11,000 square feet of floor space; 5 buildings; over an acre of land along a freight shuttle line inclosed by a Paige fence. Suitable for most any type of manufacturing. Price $100,000.

BO-110, American Machinist
330 W. 42nd St., New York 18, N. Y.

PATENT FOR SALE

Royalty basis. Patent #2318770. Bent wire clothes hanger with non-slip, non-wrinkle feature for trousers and skirts; no pins required to keep garment smooth.

R. M. D. FREEMAN
BOX 116 GOLDBORO, N. C.

WANTED
COLLETS, DIE HEADS, CHASERS, BOX TOOLS
Screw Machine Parts new or used

GRAFF MACHINE TOOL CO.
7140 SO. HALSTED ST.
All phones VINCENNES 9664
CHICAGO 21, ILLINOIS

We are interested in buying one 8½" or 11" Double Threading Goss & DeLeeuw Four-Spindle Tool Rotating Automatic Chucking Machine.

What have you to offer? Kindly advice with full description and age of machine.

W-111, AMERICAN MACHINIST
330 West 42nd St. New York 18, N. Y.

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"FALK" STOCK—A modern stock, with every item owned by "FALK" and in our warehouse or enroute. Shipments can be scheduled because "FALK" owns the machines. "FALK" critical inspection is given to every stock item.—Your inspection is welcome under ideal conditions for selecting machine tools.

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GOOD BUYS FOR THE MODERN SHOP* — IMMEDIATE DELIVERY

SHEARS

L & A 10' x 3/16".
#672 Niagara, 72" x 10 ga.
Lennox Splitting Shear, 8' throat, ¾" cap., arr. M.
Lennox Bevel Shear, ¾" cap., arr. M.D.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4½ Bliss D.C. B.G. Forging 4" stroke (2).
#4½ Bliss 3 column B.G. 3" stroke.
#5 Bliss D.C. B.G. Forging 3" stroke:
#74½ Bliss S.S. geared, 2" stroke.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Vertical, 48" Gisholt.
Hill 4" Bar Horiontal Table Type.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".

DRILLING MACHINES

Superior 26" B.G., Sl. Hd., tapping, P.F.
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Leland Gifford 2 spindle.
Woodward & Rogers 6 spindle.

RADIAL DRILLS

3' Arm 9" Col. Cincinnati Bickford
4' Arm 11" Col. Cincinnati Bickford
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
7' Arm 13" Col. Cincinnati Bickford

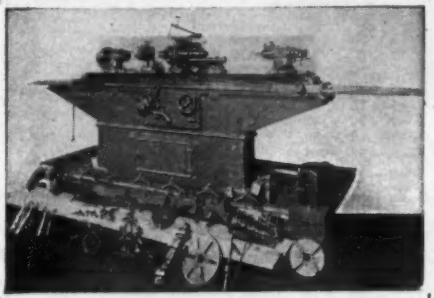
MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Natco #D-5 8 spindle #1 M.T.

GRINDERS

16" Heald Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
12" Heald Rotary Surface Grinder equip. with 9" Dia. Perm. Mag. chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump.
Oliver Model 51 Drill Grinder; 1½" cap.
Pratt & Whitney 14x36 model B vertical surface grinder.

Brown & Sharpe No. 4 Univ. Cylindrical Grinder. M.D., with regular equipment.



Capacity:—Centers swing 12" dia.; over water guards 10¾". Distance between centers 60". Takes wheels to 12" dia. x ½" to 1" thick. Longitudinal Table travel—10 changes in rate; range 1½" to 53" per minute. Work speed—6 changes for live or dead center grinding. B & S No. 9 taper hole.

MILLING MACHINES

#4 & #5 Cinn., High Power, Plain, S.P.D.
No. 3 Cincinnati, High Power, Vertical
No. 2 Brown & Sharpe, Vertical, S.P.D.
No. 0 Bickett Vertical Bench Miller
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2).
#1 Kempsmith Universal, Cone Drive.
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
Ames Precision Universal Bench Mill
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"36" N.-B.-P., Planer Shaper, M.D.

LATHES

South Bend 16" x 6' Motorized Gap Lathe
Putnam 26 x 12 Heavy QCG, arr. for M.D
American, 16 x 6 Q.C.G., Geared Head
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
LeBlond 14 x 6 Q.C.G.
Seneca Falls Tool Room 14 x 6, Q.C.G.

SHAPERS AND GEAR CUTTERS

7" Rhodes Horiz. High Speed, Belt Dr.
26" Cincinnati Triple Geared, Belt Dr.
#61-2 Fellows 36" Gear Shapers (2).
12" Schuchart & Schutte Gear Hobber.

BENDING ROLLS

Bertsch 3" x 3" x ⅜" angle bending roll.
Niagara pinch type 7' x 7" roll motor driven.

MISCELLANEOUS

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room, all sizes.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Maesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Grinding Wheels for #2 centerless 4" face, 20" diameter.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
Niagara #98 Brake & Folder, 72" cap. 14 ga. arranged M.D.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.

HEADQUARTERS FOR POWER PRESSES

**The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.*

Buy from Stock

MACHINERY

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FALK

MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER 5, N.Y.

MOREY
Dependable Used Machines

BULLARD 24" Vert. Turret Lathe—with side head; R.P.

LANDIS 20"x220" Plain Cyl. Grinder—M.D.

G. & E. 18" Univ. Gear Hobber

GLEASON 3", 6", 11" & 18" Bevel Gear Generators—2 tool type

GLEASON 10" Spiral Bevel Gear Generator

GLEASON 15" Spiral Bevel Gear Generator

K. & T. 3B Vert. Miller—Motor in Base

INGERSOLL 24" Cutter Grinder

INGERSOLL 26"x26"x12' Planer Type Miller

SAUNDERS 8-18" Pipe Threader

TREADWELL 12" Pipe Machine

LATEST TYPE MACHINE TOOLS — Built in 1942

DEFIANCE #25-A Horiz. Boring Mill—3¾" bar

GLEASON 12" Straight Bevel Gear Generator

GLEASON 3" Straight Bevel Gear Generators

MOREY No. 3 Univ. Turret Lathe—1½" cap.

ALL MOTOR DRIVEN AND INCLUDING 3 phase, 60 cycle, 220 volt, A. C. motors

GRAY 36"x36"x10' Planer—2 heads

L. T. SCHAEFER 100 ton Horiz. Hyd. Forcing Press

LYND FARQUHAR 26" Openside Crank Planer & Shaper

GISHOLT Precision Balancer

ESPEN LUCAS #138 Cold Cutting Saw—Cap. of blade 12"

SLEEPER & HARTLEY Coil Winder

CINCINNATI Gear Burnisher

THIS IS A PARTIAL LIST

Send us your specific inquiries

MOREY MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

. . . IN STOCK

AUTOMATICS
1⅞" Cone 8-Spindle, M.D. (new in 1942)
9/16" Davenport Model DA, five spindle
⅞" Cleveland Model M, four spindle
1¾" Gridley Model F, four spindle
Model H Gridley Chucking, four spindle
⅝" Cleveland Model A, single spindle

DRILLS
Avey Sensitive, four spindle
20" Barnes Camelback, single spindle
30" Sibley Sliding Head, single spindle
4 ft. Dresses Radial, s.p.d.

GEAR CUTTERS
No. 5—60" Brown & Sharpe
No. 3—36" Brown & Sharpe
No. 6 Fellows Gear Shaper, m.d.
No. 13 Brown & Sharpe
No. 12 Barber Colman Hobber
96" Gleason Spur & Bevel Gear Planer

GRINDERS
No. 2 Cincinnati Centerless
No. 72A3 Heald Gageomatic
No. 75 Heald Internal
No. 60 Heald Cylinder
10 x 24 Norton Cylindrical
10 x 30 Landis Cylindrical
10 x 50 Norton Cylindrical
20" x 144" Landis Cylindrical
24" Safety Face
No. 2 Wilmarth & Morman Surface
No. 12 Brown & Sharpe Cutter

LATHES, ENGINE
14" x 6' Lodge & Shipley, q.h.
14" x 8' Reed-Prentice, q.h.
16" x 14' Rahn Larmon, c.d.
26" x 16' Lodge & Shipley, c.d.
29" x 14' Schumaker, Boye & Emmes, c.d.
8" x 60" Fitchburg Lo-Swing, q.h.

LATHES, TURRET
42" Bullard New Era V.T.L.
No. 3A Warner & Swasey, q.h.
No. 5A Warner & Swasey, q.h.
26" Libby, q.h.
No. 5A Potter & Johnston, q.h.
No. 4 Millholland, c.d.
No. 2 Brown & Sharpe
No. 1 Warner & Swasey, c.d.
No. 0 Foster

MILLS
No. 2A Brown & Sharpe Universal, s.p.d.
No. 3 LeBlond Universal, c.d.
No. 3 Cincinnati Plain, s.p.d.
No. 1½A Rockford Plain, c.d.
No. 13B Brown & Sharpe
4" Pratt & Whitney Spline
No. 5 Becker Vertical, c.d.
42" Bullard Vertical Boring, m.d.

MISCELLANEOUS
6" Williams Pipe Machine
12" Williams Pipe Machine
Wicaco Oil Groover

PLANERS & SHAPERS
32"x32"x10' New Haven Planer, 1 head
24"x24"x8' American Planer, 1 head
32" Cincinnati Shaper, c.d.

Complete Facilities for REBUILDING and MOTORIZING Your Old Machine Tools

WRITE, WIRE or PHONE US

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1959-1969 South Meridian Street
INDIANAPOLIS 6, INDIANA
Eastern Branch:
44 WHITEHALL STREET, NEW YORK 4, N. Y.

MILES QUALITY TOOLS

AUTOMATICS
No. 0 Brown & Sharpe
1½" Gridley 4 spindle
4½" Gridley 4 spindle chucking
No. 454 New Britain chucking
7" Baird 6 spindle chucking
1" Cleveland "J" double end
14"x19" Fay automatic

BROACHES
No. 2L Lapointe hydraulic
No. 3XA Oilgear hydraulic
No. 3 Lapointe double, screw

COMPRESSORS
92', 7"0" Ingersoll Rand
427' Chicago steam driven
550' National vertical
1400' Sullivan angle compound

DRILLS
Sensitive, All makes and types
20" & 21" Cincinnati
25" Weigel
36" Barnes
24", No. 217 Baker heavy
24", No. 10 HO Baker hydraulic
3½' American radial
4' Western radial

GEAR CUTTERS
No. 16 HS Gould & Eberhardt hob
No. 1 Lees Bradner hobbers
No. 1 Fellows Shaper
24"x12" Fiather auto. spur
26"x6" Brown & Sharpe spur
36"x6" and 64"x30" G. & E. spur
Lipe 2 spdl. chamferer
12" Ingle tooth rounder
No. 4 Cimatool Peerless chamferers
15" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers
18" Gleason bevel gear lappers
8" Red Ring gear lappers

GRINDERS
6"x20", No. 10 Brown & Sharpe
8"x24", No. 1 Brown & Sharpe univ.
8"x24", No. 13 Brown & Sharpe univ.
12"x36", 16"x36" && 16"x52" Landis
No. 2 Cincinnati centerless
18" Gorton double disc
28" Gardner semi-automatic disc
6"x22", No. 78 Wilmarth & Mor. surface
6"x24", No. 3 Lasalle surface
12"x24", No. 1 Diamond surface
No. 72 Heald automatic electric sizing internal
Bergram internal for small work
Type ENB5 Ingersoll cutter
Cincinnati face milling cutter
Gisholt tool
18" & 36" Bridgeport wet tool
No. 60 Heald cylinder
No. 6 Landis cylinder
16"x48" Landis crankpin

FORGING EQUIPMENT
No. 2B Nazel air hammer
400 lb. Chambersburg bd. dp. hammer
No. 1 Evans Ajax forging roll
3" Acme upsetter

LATHES, TURRET
36" Bullard vertical, (Spiral Geared)
22" Libby, 4½" hole
21" Gisholt, 3½" hole
26" Libby, 4½" hole
26" Libby, 7½" hole
28", No. 3B Foster, 5¼" hole

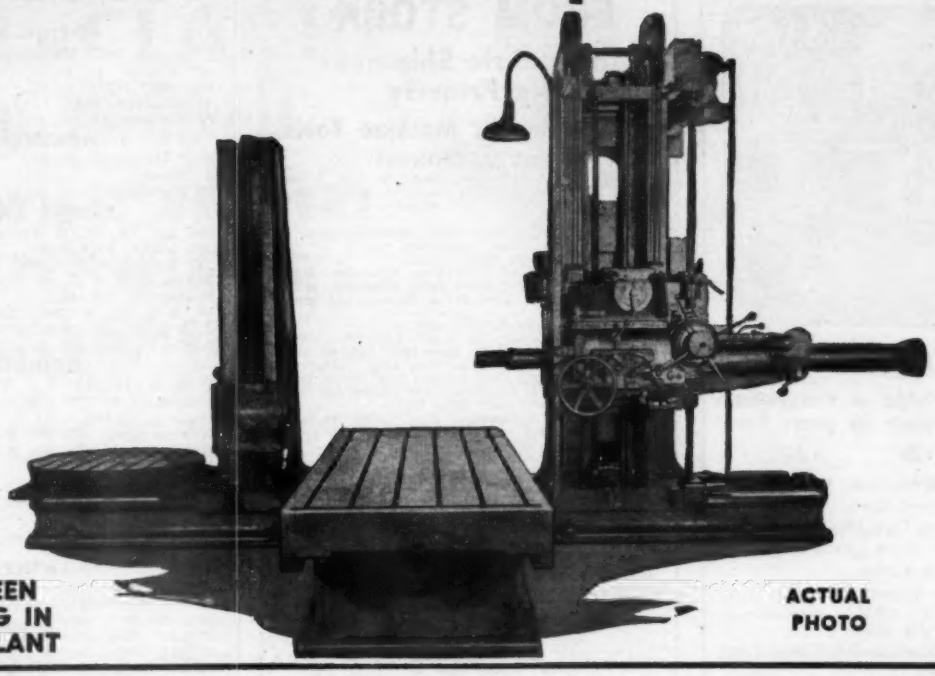
MILLERS
No. 2A Pratt & Whitney jig borer, 22"x44" table
Nos. ½ and 2 Van Norman duplex
No. 2 Kempsmith (New 1942)
No. 3 Reed Prentice vertical
No. 12 Brown & Sharpe plain mfg. with electric control (New 1943)
48" Cincinnati automatic
48" Oesterlein tilted offset
No. 6 Lees Bradner univ. thread
Type C Hall Planetary thread
Types 10 & 45 Productomatic

PRESSES
8' Ohl press brake, 88 tons
No. 2 Standard screw
No. 53 Toledo straight side
No. 6 Waterbury Farrel openback
28", No. 71 Swaine double crank

SEND FOR COMPLETE LIST

MILES MACHINERY CO.
SAGINAW, MICHIGAN

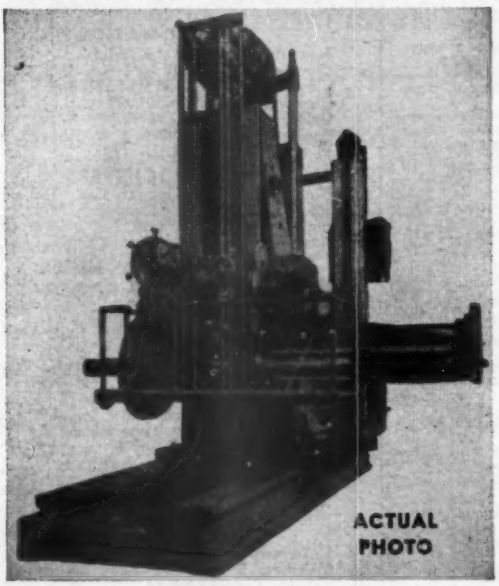
Produce for War — Prepare for Postwar



CAN BE SEEN OPERATING IN PRIVATE PLANT

ACTUAL PHOTO

5" OHIO SPINDLE HORIZONTAL BORING MILL. Table Type, 48x140" Table, 4' Rotary Table; A. C. Motor Drive. Vert. travel of head on columns 5' motor driven oil pump and piping.



ACTUAL PHOTO

8" NILES BEMENT POND HORIZ. BORING MILL. Travel of Bar Approx. 6' 7"; Overall Length of Bed 25'; Overall Height of Col. 19½'; Motor Drive with Motor.

6x72" & 6x48" PRATT & WHITNEY, M.D.
NO. 3 BROWN & SHARPE, 14x49" table, P.F.
NO. 2-B KEARNEY & TRECKER, 14x70" table.
32"x10'6" FARRELL ROLL GRINDER, will grind rolls up to maximum of 34" diameter and 10' bet. centers, 30" wheel, with AC motors.
50"x18' FITCHBURG ENGINE LATHE, Internal Face Plate Drive; D.B.G.; Loose change gear; M.D. 8' bed extension.
36"x17' AMERICAN GEARED HEAD QUICK CHANGE GEAR LATHE; 11' between centers; AC M.D.

HORIZONTAL BORING MILLS

7" BARRETT CYLINDER BORING BAR, Floor Type.
5½" NILES, Table Type, Table 23"x78"; B.G.
5" NO. 229 DETRICK & HARVEY, Floor Type, No. 6 M.T. Outboard support; Runway for column 11' long, Motor drive with motor.
4" KEMPSMITH, Floor Type, 42"x60" table; No. 5 M.T., M.D.
3¾" BARRETT, Floor Type, No. 6 M.T., M.D.
3½" BEAMAN & SMITH, Table Type, 24x48" table.
3" PUTNAM, No. 5 M.T., P.F.
FOOTE-BURT 2-Way Drilling & Boring Machine.

VERTICAL BORING MILLS

72" COLBURN, Geared Feeds, Rapid Traverse, 4 Chuck Jaws, with 3 swivel heads on rail.
51" BULLARD, 2 swivel heads on rail, B.G., 50" table.
48" ROCKFORD, 3 spindles 48" rotary table.
4-Spindle ROCKFORD, 38" table.

6" BULLARD "MULT-AU-MATIC", 4 stations, 1 loading and 3 operating coolant pump, M.D. Serial No. over 14,000, EXC. CONDITION.

PLAIN MILLS

NO. 5-B BROWN & SHARPE, A.C. M.D. 22½x73" table, EXC. COND.
NO. 4 LEBLOND, Hvy. Duty, 16x68" table, M.D.
NO. 4 CINCINNATI, 16x64" table, M.D.

PLANER TYPE & SLAB MILLS

42"x36"x12' BEAMAN & SMITH OPENSIDE PLANER TYPE, 1 vert. head, 1 side head.
42"x42"x13' INGERSOLL SLAB, 1 vert. hd. M.D.

PRACTICALLY NEW TYPE P OHIO PRODUCTION MILL; New in 1941. Timken bearing spindle; 16x72" table, Rapid traverse, Power feed, M.D.

PLANERS

36' SELLERS PLATE PLANER, 34 pneumatic holddowns, motor drive with motor and control.

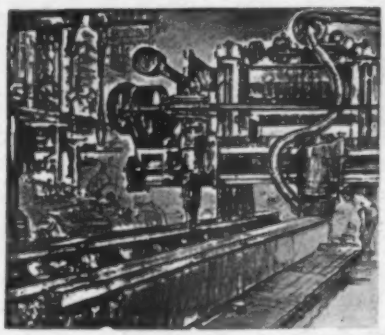
DOUBLE HOUSING

60"x60"x18 FT. POND, 2 Hds. on rail, M.D.
60"x44"x12' GRAY, 4 Hds., M.D. with 20 H.P. motor.
44"x36"x12' GRAY, 2 Hds. on rail.
36"x32"x12' GORTON Double Hd., 37" bet. housings.

MONA MEMBER

INTERSTATE Machinery Co., Inc.
1439 W. PERSHING RD., CHICAGO 9, ILL.

ENGINEERED REBUILDING



By Simmons

Every machine listed in this column is in our warehouse at press time.

●

42" BULLARD NEW ERA, 11000 serial
42" N.B.P. Car Wheel Borer
66" N.B.P. Vertical Tire Mill
27" BRIDGEFORD Axle Lathe
29" PUTNAM Axle Lathe
42" PUTNAM Car Wheel Lathe
2½" Bar CLEVELAND Horizontal, Table Type Boring Mill
2¼" Bar LUCAS Horizontal, Table Type Boring Mill, M.D.
5" Bar DETRICK-HARVEY Floor Type Boring Mill
4' HAMMOND Sensitive Radial Drill
7' AMERICAN Universal Radial Drill
BLANCHARD No. 16 Surface Grinder
33" x 9" G&E Spur Gear Cutter
36"x18' N.B.P. Lathe, G.H., M.D.
No. 2 CLEVELAND Plain Miller
No. 3-B MILWAUKEE Plain Miller
#4 BROWN & SHARPE Universal Miller
No. 5-B B&S Plain Miller
No. 6 BECKER Vertical Miller
No. 10 N.B.P. Heavy Vertical Miller
24"x24"x12' INGERSOLL Planer Miller, M.D., 3 heads
24"x36"x12' INGERSOLL Side Head Planer Miller, M.D.
30"x36"x12' INGERSOLL Planer Miller, M.D., 3 heads
30"x30"x10' NEWTON Slab Miller
24"x24"x6' WHITCOMB Planer, one rail head, 230 Volt, D.C.
30"x30"x12' N.B.P. Planer, two heads, 230 Volt, D.C.
36"x36"x12' POWELL Planer, 4-heads A.C. Motor Drive
48"x48"x20' PATCH Planer, 4-heads, 230 Volt, D.C.
48"x48"x24' N.B.P. Planer, 3-heads, A.C. or D.C. Motor Drive
72"x72"x18' N.B.P. Heavy Planer 4-heads, 230 Volt, D.C.
60" Throat L & A Shear
RT-40 SCHULTZE-NAUMANN Beam Shear
5" Capacity U.E.F. Alligator Shear
72"—105-Ton L&A Multiple Punch
6"x⅝" SOUTHWARK Double Angle Shear
12" SELLERS Crank Slotter
20" SELLERS Crank Slotter
2" LANDIS Pipe Threader
6" BIGNALL-KEELER Pipe Threader

SIMMONS ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 North Broadway, Albany, N. Y.
N. Y. Office: 50 East 42nd St.

EASTERN OFFERS FROM STOCK

Immediate Shipment No Priority

Eastern Rebuilt Machine Tools

GEAR MACHINERY

No. 2HS Lees-Bradner Gear Grinders, m.d., latest type, for spur and helical gears up to 12" dia.
6" Pratt & Whitney Single Wheel Gear Grinder, m.d.
3" Gleason Straight Bevel Gear Generator, m.d.
8" Gleason Mfg. Gear Generators, m.d.
No. 64 Fellows Gear Shaper, m.d.
11" Gleason Straight Bevel Gear Generator, m.d.
12" Gleason Straight Bevel Gear Generator, m.d.
30" Brainerd Auto. Gear Cutter for spur and bevel gears.
48" Cleveland Gear Hobber, m.d.
No. 3-26", No. 4-36", No. 3-36", 4-48", No. 6-66" Brown & Sharpe Auto. Spur Gear Cutters
No. 3-26" Cincinnati Auto. Spur Gear Cutter
No. 13 LS Fellows Gear Lapper, m.d., latest type
No. 36B Gould & Eberhardt Gear Cutter, for spur and bevel gears, m.d., latest type
No. 36S Gould & Eberhardt Gear Cutter, for spur gears only, m.d.
No. 61 Fellows Gear Shaper, belt
No. 72 Fellows H.S. Gear Shaper, m.d.
Cross Gear Tooth Rounder, belt
24" Cross Gear Tooth Rounder, m.d.
Cincinnati Gear Burnisher, m.d. in base
Gleason Spiral Bevel Gear Rougher, s.p.d.

CYLINDRICAL GRINDERS

6x18" Landis Plain Self-Contained, m.d.
6x32" Norton Plain, 3 m.d.
8x36" Cincinnati Saddle Type, m.d.
10x36" Cincinnati Plain Hydraulic, model EA, m.d.
10x48" Landis Type C Plain Hydraulic, m.d., latest type.
10x48" Brown & Sharpe Plain, m.d.
10x52" Landis Plain Self-Contained, m.d.
10x72" Landis Plain Self-Contained, m.d.
12x36" Cincinnati Plain, belt
12x36" Modern Plain, belt
12x36" Modern Plain, m.d.
12x42" Landis Pla.n, belt
12x48" Cincinnati Plain Self-Contained, 3 motor drive
14x48" Cincinnati Plain Self-Contained, 3 motor drive
12x48" Modern Plain, belt
12x72" No. 16 Brown & Sharpe Plain, belt
12x96" Landis Plain Self-Contained, m.d.
14x18" Cincinnati Plain Self-Contained, 3 motor drive
16x72" Landis Plain Self-Contained, m.d.
16x216" Landis Plain Self-Contained Type B, m.d., latest type
20x12' Landis Plain Self-Contained, m.d.
26x96" Landis Plain Self-Contained, m.d.

HORIZONTAL DRILLS

8 spindle Hammond, m.d., hydraulic feed
Lore Bros., m.d., No. 4 Taper
Pratt & Whitney Rifling Machine, belt
No. 1 Pratt & Whitney Gun Barrel Drills, m.d.
5 spindle Detroit Horizontal, belt
6 spindle National Acme Automatic, belt

RADIAL DRILLS

3' American Sensitive, belt
3' Fosdick Sensitive, s.p.d.
3½' Cincinnati-Bickford Plain, m.d.
4' American Triple Purpose Plain, m.d.
4' Cincinnati-Bickford Plain, m.d.
4' Cincinnati-Bickford Plain, m.d. on arm
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared Plain, gear box
5' Cincinnati-Bickford Plate Hole Driller, d.e. motor on arm
5' Dreses Plain, gear box on base
5' Niles-Bement-Pond Full Universal, gear box
5' Prentice Plain, U.S. Vari-Drive
5' Carlton Plain, m.d. on arm
6' Cincinnati-Bickford Full Universal, gear box
6' Niles-Bement-Pond Semi-Universal, m.d.
6' Reed-Prentice, gear box
6' Western Plain, gear box
8' American Triple Purpose Plain, d.e. motor on arm
8' American Triple Purpose Plain, U.S. Vari-Drive on base

UPRIGHT DRILLS

22" Barnes All Geared Self-Oiling, m.d.
24" Hoefer Upright, m.d.
26" W. F. & John Barnes, belt
30" Rich Heavy Duty, m.d.
30" Prentice, m.d.
D3 Colburn H.D. m.d.

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No. 2 Cincinnati, m.d., 8" wheel mount, hydraulic wheel dresser
Cincinnati Valve Seat Grinder, m.d., diaphragm chuck, cap. ⅝" valve stems

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34" Rogers
66", 120" Niles
42" Bullard, M.D.
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2½" Universal, Binsee
4" Binsee
3" Cleveland

TURRET LATHES

No. 2A, 3A, W. & S. 4½" hole
18" Libby, 3½" hole
24" Gisholt, 6½" hole
Foster Nos. 4, 5, 6
Foster No. 1B, M.D.
W. & S. No. 4 Univ., Grd. Hd., M.D.
J. & L. 2¼x24, 3¼x36"
Acme 3¼x36" grd head

GRINDERS

P. & W. 14", 18" B.B. Vert., M.D.
Blanchard 26", 30", M.D.
Modern 12x48", M.D.
Norton Hydr. 12x18", M.D.
Heald No. 50, 55, 60, M.D.
Norton 50"x28', M.D.
Gardner 72" Disc, M.D.
Landis 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
B & S #3 Univ.
B & S #11 S.P.D.

LATHES

14"x6' Hendey, Taper
48"x12' Harrington Gap Sid. Bed
McCabe 26-42"x14'
32"x25' New Haven, raising blocks to 60"
20"x14' Rahn-Larmon, raised to 24", M.D.
16"x8' Lodge & Shipley Grd. Hd. Taper, M.D.
14"x6' Mulliner, taper
14"x6' Sebastian Grd. Hd.
9" LeBlond Automatics
Wickes 32"x26', M.D.
LeBlond 36"x21' M.D.
Putnam 36"x30', M.D.

AUTOMATICS

New Britain 1⅝", 6 spindle
Cleveland Model A, ½", ⅝", ¼", 2"
Cleveland ¾" Model M 4-spindle
Cleveland Model B, 1", 2"
Gridley 4¼", agle, spdle.
B. & S. Nos. 00, OG, 2
P. & J. No. 6A, M.D.

GEAR CUTTERS

No. 3, 12 Barber-Colman Gear Hobber
No. 6 Fellows Gear Shapers
B. & S. No. 3-26", 4-36"
Gleason 11" Bevel

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No. 20 Van Norman
10" P. & W. Automatic
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. Rpd. traverse, M.D.
Nos. 0Y, 1Y, 3, 4, 5, B. & S. Plain & Univ.
B. & S. No. 12, 13, 13B
Hall Planetary Model D
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12 Profiler, dbl. spindle
30" Pratt & Whitney Profiler
No. 4, B. & S. Universal

RADIALS

5' Dreses, Full Universal
8' Amer. Triple Purpose
3', 3½' Cinc-Bickford
4' Mueller, M.D.
4', 5' Western, S.P.D.

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6 spindle Avey Drill, 15" overhang
800 ton Coining Press, McCabe ½" Flanger
Rochester 5B Hammer
Pels 6' Throat punch
P. & W. 6" Vert. shaper
Marvel Metal Band Saw, M.D.
Pipe Machines, 4", 6", 8", M.D.
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6x80" P. & W. Thread Miller
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CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

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10x36	14x36	16x72
10x50	14x50	18x96
10x72	14x72	18x120
10x120	14x96	18x168
	16x30	24x192
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4¼" Gridley Model F single spindle
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60" Bickford Vertical Boring Mill
#81 Heald Gagematic Grinder, M.D.
#2 Brown & Sharpe Vertical Mill
60"x60"x10' Cincinnati Planer
2-8" Bullard 6 spdl. Mult-au-matics.
#33 Kempsmith Production Mill motorized
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Grinder, 10' Bridgeport, Knife
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Lathe, 20"x10' L & S. Grd. Hd.
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Miller & Shaper, #14 Cochrane-Bly, Vert., M.D.
Shaper, 20"-24"-32".
Shaper, 36" Morton, Draw Cut.

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5' American Plain Radial Drill
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1—Norton 14"x60" Norton Plain Cylindrical Grinder.
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AUTOMATICS, Acme, Model C—9/16" M.D.
AUTOMATICS, Gridley, 9/16, ⅝ & 1¼" Mod. G.
AUTOMATICS, Cone, 1¼ & 1½" 4 spindle
AUTOMATICS, Gridley, ¾, 1¼, 1¾ & 2¼" Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 4¼" S. S.
AUTOMATICS, Cleveland, 1¼, 1½ & 2¾" Mod. A
AUTOMATICS, Cleveland, ⅝, 1¼, & 2" Mod. B
AUTOMATICS, Cleveland ⅝, 1¼ & 1½" Mod. M
AUTOMATICS, Cleveland 3½" Model K4—M.D.
AUTOMATICS, Greenlee 2" 6 spdle., M.D.
AUTOMATICS, New Britain #22 & 24 M.D.
AUTOMATICS, New Britain 1⅝"x7" 6 spdle., M.D.
AUTOMATICS, Potter & Johnston #5a & 6A
BORING MILLS, 24" Bullard M.D.
BORING MILLS, Rockford, 3½" bar, Horizontal, 24x72" table, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6.
GRINDER, Brown & Sharpe #2 Universal M.D.
GRINDERS, Cincinnati 12" x 18" Plunge Cut
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Pratt & Whitney, 14" Vertical Surface, M.D.
GRINDERS, 9x31" Magnetic Chuck
GRINDERS, P-Arter 12" Rotary surface, M.D.
GRINDERS, Van Norman Internal #34 M.D.
LATHES, Hendey, G.H. 12"x5' and 6', M.D.
LATHES, Monarch 14"x6' & 20"x8' M.D.
LATHES, Warner & Swasey, #2, 4, & 6, M.D.
MILLING MACHINES, #29 Ohio Universal, M.D.
MILLING MACHINES, Becker Vertical Model S. D. 40" Rotary Table
MILLING MACHINES, Becker Vertical #5 & 6
MILLS, Briggs Production Type A&B
PLANER, Ohio 42" x 42" x 12' One Head, M.D.
PLANER, Gray 30" x 30" x 8', 2 Ball Heads

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ACME-GRIDLEY 1⅝".

Cleveland ⅞" to 2½".

Cone 1¼", 1½", 2½".

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Gridley, Models F, ¾", ⅞", 1¼", 1⅜", 2⅛", 2⅜", 3¼", 4¼".

Large Stock 1⅜" F. Gridley Collets.

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6" Pratt & Whitney Gear Grinder, M.D. 1937
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D.
Cincinnati Gear Chamfering Mach., M.D.
Lees-Bradner Gear Grinder

PLANERS

28"x28"x8' Woodward-Powell Planer 2 Hds.

MILLERS

2H Kearney & Trecker Vert. (2)—1941
U.S. Multi-Millers (4) 1941
No. 23-B Deflance Hor. Bor. Mill 3¼" bar, New 1941
No. 10 Brown & Sharpe—1941
No. 1—12" and 1—18" Cincinnati Plain Automatic millers latest type (2) 1941
No. 2 Cincinnati Vertical Miller, Dial Type 1941
New No. 3 Wigglesworth
4" Taylor & Fenn Duplex Splines 1941

GRINDERS

No. 72-A—3—Heald Plain 1940
No. 72-A—3—Heald Sizematic 1940
10"x72" Model C Norton 1941
12"x120" Landis Pl. M.D.
No. 10 B & S Plain Grinder, M.D.

LATHES—TURRET LATHES

22"x72" Ledge & Shipley 1941
24"x72" LeBlond Lathe 1941
16" Model C Monarch Keller (1941)
No. 1A Warner & Swasey (2) 1941
6"x8½" Geo & DeLeeuw Chucking Machine
No. 8R Cincinnati Acme 1941
24" Bullard Vert. Turret, Hi-Speed 1940

MISCELLANEOUS

No. 00 1" New Britain (6)—1941
1½" Consenatic 4 spindle 1940
No. 0-Ajax Forming Roll 1941
No. 21-SA Cochrane-Bly H.S. Saw
No. 171 Bliss Stiles Sprue Cutter
New Delta Drilling Equipment
No. 4 Hvy. Duty Cilburn Drill

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⇕3H K & T Sliding Head Vertical Millers, M.D.
1—5' American triple purpose plain radial drill, motor on arm.
⇕4 Cincinnati High Power Plain Miller, S.P.D.
⇕4 Cincinnati Vertical Miller, H.P.S.D.
6' American Triple Purpose Plain Radial Drill, M.D.

HEAVY DUTY MACHINE TOOLS

52" Bullard Vertical Boring & Turning Mill.
54" Colburn Vertical Boring & Turning Mill.
60" Gisholt Vertical Boring & Turning Mill.
60" Betts Vertical Boring & Turning Mill.
5' American Triple Purpose Pl. Rad. Drill.
6' American Triple Purpose Pl. Rad. Drill.
6' Cincinnati Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
⇕4 Cincinnati High Power Plain Miller, PRT.
⇕4 Cincinnati High Power Vert. Miller, PRT.
⇕3B Milwaukee Plain Miller, S.P.D.
⇕3 Brown & Sharpe Vertical Miller, S.P.D.

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12" x 96" Landis Plain, S.C.
16" x 72" Landis Plain Self contained.
18" x 85" Landis Plain Self contained.

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18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.

PLANERS

42" x 42" x 20' Cinn. Hypro, 4 Hds. D.C. drill.
36" x 36" x 10' Gray 3 Heads. D.C. Drive complete.

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OPENSIDE PLANER
48" x 48" x 19'

Detrick & Harvey, 3 Heads
LOW PRICE FOR QUICK SALE
THE O'BRIEN MACHINERY CO.
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1—27"x12 ft. CENTERS 12 SPEED GEARED HEAD PRENTICE LATHE with Quick Change Gears, Taper Attachment, Reverse in Apron —with 10 H.P. 3-60-220 "V" Belt—Motor Drive—Also equipped with Raising Blocks to swing 40". Price $2500.00 for quick sale.
1—306½ BLISS S.S. PRESS 160 TON M.D. AIR CLUTCH 6" STROKE 27"x27" BED
1—1500# STEAM DROP HAMMER
1—48"x48"x20' Detrick & Harvey Openside Planer with extra housing & 40 H.P. constant speed motor drive 230 direct current two heads on cross rail & one side head.
1—10'/18' BETTS VERTICAL BORING MILL —$10,000
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MASSILLON, OHIO PHONE 8180

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Brake, Chicago steel, 3'
Broaching machine ⇄1 LaPointe
Drill, two-spindle sensitive, ⇄1 Morse taper
Drill, Bickford 42" radial
Drill 4-spindle sensitive
Grinder, LaSalle Surface
Hammer, 30⇄ Bradley upright, helve
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Lathe 15"x12' Bradford loose change
Lathe 15"x6' Carroll-Jamieson with draw-in attachment and collets.
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Punch & Shear two ½" capacity
Shaper 24" G & E
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600 TONS CAPACITY

Distance between housing, 12'-4". Motor-Driven. Machine in Good Condition.

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Steam hammers 1000 #, 800#, 500#, Bignall-Keeler 8" pipe threader, Cochran-Bly #2 circular saw and saw sharpener; back geared #3 and #4 Morse taper drill presses, Pratt & Whitney, #3 die sinker, Williams & White #2 Bulldozer, Ajax Forging Rolls.

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4" upsetter, 150-200 ton trimming press

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BARNES 4-Sp. Geared Camel Back Drill
BULLARD 24" M.D. Vert. Turret Lathes (2)
CIN. 48" Pl. Auto. Miller M.D.
NILES 12" Vert. Shetter
MILWAUKEE ⇄3-B Vert. Miller, M.D.
BLANCHARD 24" Vert. Surf. Grinder
DIAMOND M. D. Horiz. Surf. Grinder
CLEVELAND 2¾" Bar M.D. Horiz. Boring Mill
BROWN SHARPE ⇄3 Pl. Horiz. Miller
NILES 24" M.D. Vert. Boring Mill 2 HDS.
SMALLEY GENERAL ⇄33-A Thread Miller
AMERICAN 24" x 12' M.D. Grd. Bd. Lathe
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3¾" Cleveland Automatic Screw Machine, Serial #21890 Single Spindle Belt Drive is in operation. Make offer.

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FOSDICK 3¼' Radial Drill, S.P.D.
POTTER & JOHNSTON 15" Shaper, M.D.
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CINN. 28"x24"x24" CRANK PLANER.
MILWAUKEE No. 2-B Double Over-Arm Plain Miller, MOTOR DRIVE.
Available immediately—Also many other tools

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1—30,000# STEAM DROP HAMMER

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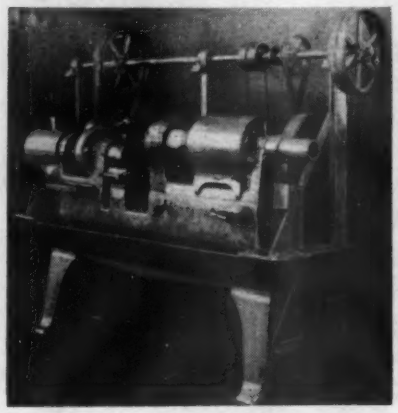
Ten—2" CLEVELAND MODEL A SINGLE SPINDLE AUTOMATIC SCREW MACHINES



Arranged for motor drive without motor, chuck capacity diameter 2". Length of stock feed 10½". Milling length 5½".

Price ..... $750.00 each

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1—36"x36"x12' Cincl. Dbl. Housing Planer 2 rail hds., 1 side hd., D.C. m.d.
1—36" widened to 48"x36"x16' Gray Dbl. Housing Spur Grd. Planer with 3 hds., 3-speed A.C. m.d.
1—56"x56"x18" Cincl. Dbl. Housing Planer with 3 hds. D.C. vari. speed m.d.
1—6' Niles Pl. Radial Drill, rebuilt, gear box, A.C. m.d.
1—12"x18" Cincl. Rebuilt Plunge Cut Grinder, 18"x9" face wheel, A.C. m.d.

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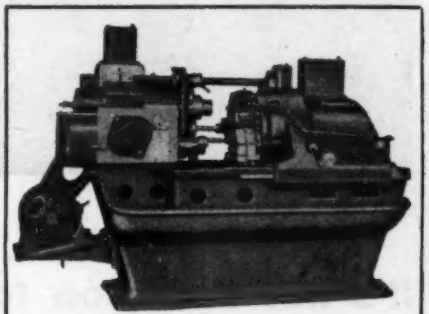

8½" X 8" GOSS & DELEEUW CHUCKING MACHINE

Capacity 8½" in diameter x 8" long 5 chucks on turret

Maximum opening between chuck jaws 9⅝"

Minimum opening between chuck jaws 7⅝"

Maximum distance spindle nose to face of turret 23¾"

Dies and taps controlled by positive lead screw

Arranged for Motor Drive, without motor Weight approximately 12,000 lbs.

(Available for Prompt Delivery)

Emerman Machinery Corporation
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No. 5 Cincinnati Plain Mill, S.P.D.
Norton 10" x 36" Grinder, M.D.
6" x 15" J & L Thread Grinders

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84" Niles-Bement-Pond, 28' long, 17' centers 72" geared face plate DC drive.

36"x26' Wickes Grd. Hd. M.D.

36"x21' LeBlond Grd. Hd. M.D.

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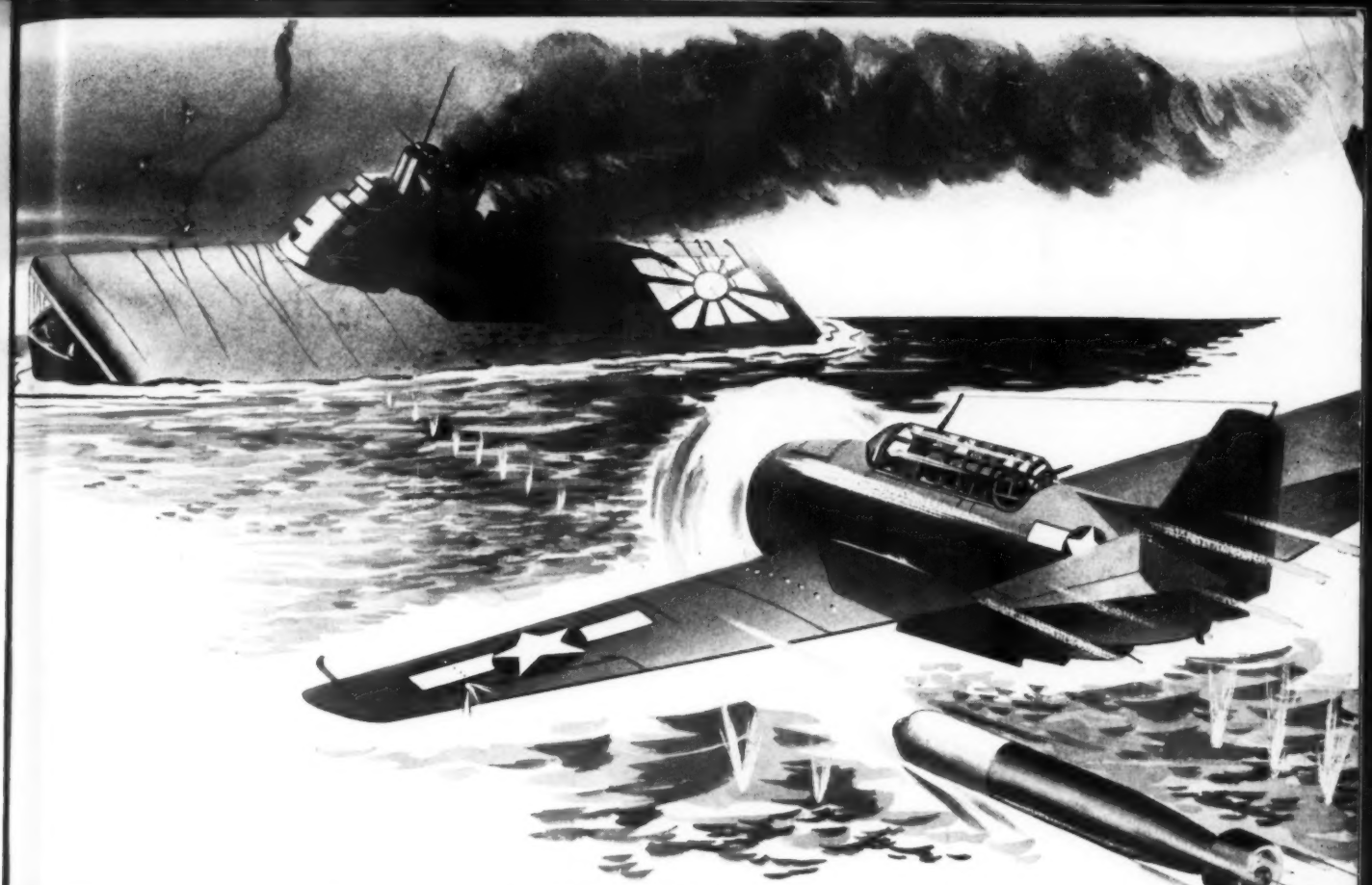
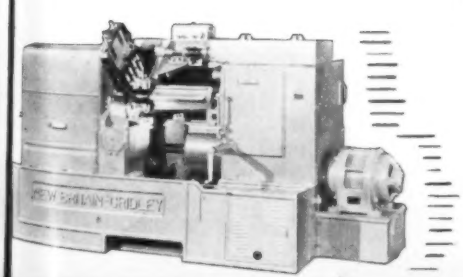


THE FOURTH DECEMBER 7

Although "Pearl Harbor Day" deserves to live only in infamy, it marks the beginning of American Industry's three greatest years of service to the nation and to the world.

Had that service fallen short of the near impossibilities called for, The United Nations would not now be looking forward to assured victory.

The way ahead is difficult. We must not only keep producing for Victory, but we must take the lead in creating a soundly prosperous peace. The job is unspectacular from here on, but all-important. The best guarantee of success is to look at the American Manufacturer's record of the past three years.



NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

Since this die has been made of GRAPH-MO STEEL press room troubles have stopped

This die is used to blank and form cages for Timken Roller Bearings. It's a fussy job. The cage blanks must be accurate and scratch-free to meet the rigid standards demanded for Timken Bearings.

Many tool steels were tried for this die. The best life provided by any of them was 1,000,000 pieces, and it was necessary to regrind the dies after 50,000 pieces were run. Pick-up, galling, scoring and pitting were also problems when those steels were used.

Since the dies have been made of Graph-Mo Steel, they blank and form 300,000 perfect, scratch-free pieces before they have to be reground, saving six to seven hours per run by eliminating non-productive time required formerly to make frequent die assembly installations. Because 80 cages are blanked and formed every minute, the time saved made production figures soar. In addition dies made of Graph-Mo Steel produce 3,000,000 pieces - - - three times the life offered by ordinary tool steels.

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TIMKEN
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